Factory
Management and Maintenance

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CONTENTS

Industry Now Has a Labor Law 39
An editorial

What the Labor Board Thinks the Labor Law Means 40
Answers to some of your favorite questions

Headed for the Bowwows? 43
Factory's labor editor sizes up the situation

With Never a Post Mortem 45
Three-man cost control in 300-man plant

Handle Less, Earn More 48
New layout saves 25 per cent in cut-off costs

It's This Way in Washington 50
Monthly report from Capitol Hill

Profit Sharing Is Probably Not the Thing to Do 51
Four alternatives to sporadic hand-outs

Halved Paperwork 53
Motion study applied to factory order routine

That Shortage of Skilled Labor 54
Survey shows it exists only in metal working

Exit the Buck Passer 56
"Mistake Report" shows him the door

Job Shop Inspection on Bonus 58
This plan pays for production and judgment

Women Are More Conscientious 60
Another tip from a practical psychologist

You Want to Know 61

Instrument Doctors 62
Why not send your meter man to school?

High See Level 64
Good light, day or night, at new De Soto plant

A Contactor for Every Need 66
Be sure you pick the right one

When Wiring Your Plant 68
First find out what your requirements are

Operating Shorts
- Spare Resistors for Electric Locomotive 71
- Refinishing Painted Concrete Floors 71
- Bridges Make Trucking over Rails Easy 71
- Special Handling for Machine-Tool Spindles ... 72
- Dummy Fuse Warns Meddlers to Keep Hands Off 72
- Loads Slide Safely on These Pallets 72
- Gage Saves Time in Watch-Case Inspection ... 73
- Measures Distances with a Tricycle Wheel 73
- Fireman's Tools Yesterday, Museum Relic Now .. 73
- Mounted Blueprints Stay Flat Despite Weather 74
- Colloidal Graphite Prevents Seizing of Threads 74
- Converting Minutes to Decimal Hours 74

Safety Instructions for Employees 75
Data Sheets

What's New in Equipment 77

Sayings and Doings 90

Trade Literature 100

Books 106

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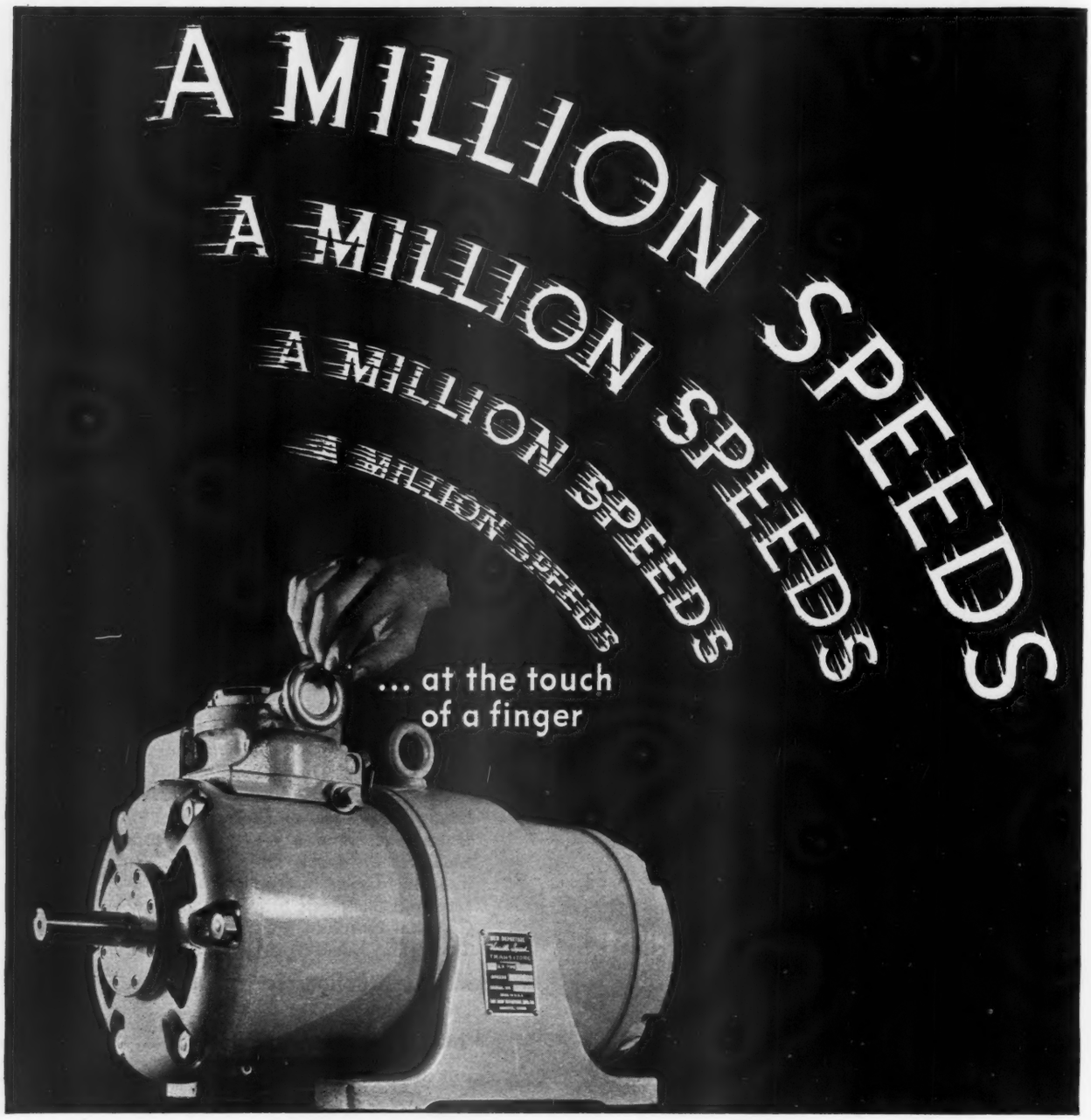

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Factory
Management and Maintenance
L. C. MORROW • EDITOR

Industry Now Has a Labor Law

INDUSTRY now has a labor law. So says the Supreme Court. The interpretation is so broad that apparently most manufacturing is affected. That management will do its best to operate amicably under the law should go without saying. This is a sincere conclusion, based on the reactions of many industrial executives.

Two phases of operation under the law are of particular interest at this time. First, just what does the law mean? Second, how will the law be administered?

The law says that it shall be unfair practice for an employer to interfere with, restrain, or coerce employees: In the exercise of self-organization; in the forming, joining, or assisting of labor organizations; in bargaining collectively through representatives of their own choosing; in engaging in concerted activities for the purpose of collective bargaining or protection.

The terms "interfere with, restrain, coerce," are subject to different interpretations. For example, according to one interpretation an employer who advised his employees not to join a specific organization would be disobeying the law. According to another, he would be exercising the right of free speech.

What is a "concerted activity"? Is the sit-down strike one? The production slow-down? The action of a "flying squad"?

Further, the law says that people designated or selected by the *majority* of the employees in a unit are to be the *exclusive* representatives. When can the selection be made? Can the employer call for an election as soon as employees propose bargaining, or as soon as a strike starts? Or must the election be held only when the organizers are satisfied that they have a majority? Under what conditions can an employee representation group act as bargaining agents?

These questions and many more will have to be answered only after benefit of experience. How they are answered will depend largely upon the National Labor Relations Board which, as judged by findings in cases that have been heard, is a pro-labor board. For that matter, administration circles have never claimed that the law is other than a labor law, intended to further organization.

All these details aside, it is evident from the experiences and developments of the past few years that in the future management is going to deal largely with organized labor. Perhaps in the long run that is all to the good. Perhaps it is just as well that the Supreme Court decision went as it did—otherwise there would have been another law, another test, and so on.

Amicable relations *can* be had between management and organized labor. Certainly, if enough of the right kind of labor leaders come to the front, we shall tend toward stability in labor relations. It is upon their advent, and upon the extent to which the Labor Board gives unbiased and economically sound decisions and rulings, that harmony in employer-employee relations now depends.

BUT a law so one-sided as the one we are considering can never bring about complete harmony. There will have to be set up a list of practices that are unfair on the part of labor. There will have to be put into use some machinery by which not only management but also the public and the members of the labor organizations themselves can know that the organizations are functioning honestly and soundly.

It is just as important to labor as to management that these things be done. Continual strife is bound to make for the curtailment of liberties by playing into the hands of the advocates of nationalization.

What the Labor Board Thinks the Labor Law Means

PAUL WOOTON
Washington Editor

DECISIONS in 135 cases rendered during the past eighteen months reveal in some detail what the National Labor Relations Board thinks the National Labor Relations Act means. A study of those decisions, as well as of the speeches and other public utterances of Board members, gives a further insight into the opinions of the men whose interpretation and administration of the law is of renewed interest to management since the constitutionality of the act has been upheld.

Since the Board is a quasi-judicial body, it has adopted the policy of expressing no opinions interpretative of the act until the particular facts of the case are laid before it. For that reason J. Warren Madden, the chairman of the Board, and its other members, Edwin S. Smith and Donald Wakefield Smith, are not in a position to answer many of the questions that are now reaching them in great numbers. Many of these questions, however, can be answered simply by an analysis of what has been said in decisions and otherwise.

Your favorite questions answered. Timely analysis—based on intimate knowledge of the Labor Board's sayings and doings—of how its members may be expected to interpret the Labor Relations Act

The question being asked most frequently is whether an employer has the right under the act to appeal for an election to decide with which group of his employees he should deal.

Judging from the decisions and what has been said in conferences with the press and at hearings before congressional committees, it can be said definitely that the Board feels that management should not concern itself in any way with the determination of employee representatives. Members of the Board feel that, if management were allowed to influence an employee election in any manner, it would negative the words "free choice" as used in the act and would continue in force those causes of unrest that the act intends to remove.

The act states that, whenever a question affecting interstate commerce arises concerning representatives of employees, the Board may investigate the controversy and certify the representatives who have been designated, or it may conduct a secret ballot of employees so that such representatives may be ascertained.

In the regulations promulgated by the Board for the administration of the act it is specified that a petition requesting certification or requesting an election may be filed by any employee or any person or labor organization acting in his behalf. There is absolutely no mention of any such right being extended to the employer.

It is known that the Board feels that it frequently would be possible for an employer to influence a situation to the point where a majority of his workers are complacent to his wishes. This domination might not necessarily be acquired through favors but merely through the power wielded by his right to hire and fire. The Board feels that if at this point the employer should have the privilege of demanding that the Board itself conduct an election the balloting might be expected to result in a victory for the group that was in the employer's favor.

THERE can be no doubt that the members of the Board feel that any such situation would interfere with the intent of the statute and would result in freezing the situation into the exact mold desired by management. They have contended that the workers' right to select their own representatives and employer dominance over their choice palpably cannot be made to mix. Either you have the one or you have the other. The Board interprets the intent of Congress as looking toward an ultimate decrease of industrial strife through the democratic control by workers of their own organizations. Their contention is that this end could not be achieved if management were allowed to appeal for an election at any time it sees fit.

Attention frequently has been called at the Board's offices to its interpretation of the intent

of the Congress in enacting this law, which was the removal of the cause of industrial disturbances growing out of the refusal of employers to permit employee organization, or to deal with an organization which a majority of its employees choose as their representative. During hearings on the Wagner Bill it was brought out that nearly half of all strikes are caused by disputes between management and labor over the right to organize, and that this cause of trouble was on the increase. The situation gave rise to grave national concern, of which the 73d Congress took note. As a result it passed the Wagner Bill. Attention also has been called to the fact that Congress was influenced by the success that had followed democratic collective bargaining in the railroad and men's clothing industries. The feeling at the Board is that, since the right of workers to organize and bargain collectively had long been recognized by the courts, the labor law simply was intended to make that theory a working principle in labor relations.

The Board frequently has called attention to limitations in the scope of the act. It recognizes that it can intervene only in disputes that may burden or obstruct interstate commerce. Such of these disputes as it may enter, in turn, must be confined to those arising out of employer denial of the right to organize and to bargain collectively through representatives of the employees' own choosing. It is recognized that the Board may not concern itself with disputes over wages, hours, or other terms of employment. It may neither conciliate, nor mediate, nor act as arbitrator.

It is known that the Board considers that employers have equal rights with employees under the act since that statute goes no further in protecting employees than to guarantee them rights of association and bargaining through representatives. If, for instance, the word "management" were substituted for "employees" in Section 7 of the act, and the word "trade" for "labor," it would read as follows:

"Management shall have the right to self-organization, to form, join, or assist trade organizations, to bargain collectively through representatives of its own choosing and to engage in concerted activities for the purpose of collective bargaining or other mutual aid or protection."

The feeling is that it would be highly absurd to undertake to guarantee to management its right to name anyone it wishes to represent it in bargaining with employees, since that right is of long standing and has never been challenged. The president, the superintendent, the personnel manager, all are industrial representatives for the purposes of collective bargaining. Members of the Labor Relations Board think it is obvious that they do not need to have that function protected by law.

THERE IS a significant decision of the Board, however, that deals with the obligations of management once the employee representatives have been received in conference and negotiations begun. Management's duty under such circumstances is set forth in the following extracts from the Board's decision in the case of the St. Joseph Stockyards Company:

"We therefore conclude that the act imposes upon employers the duty to meet with the duly designated representatives of their employees, to bargain in good faith with them in a genuine attempt to achieve an understanding on the proposals and counter-proposals advanced, and, finally, if an understanding is reached, to embody that

Acme

Members of the National Labor Relations Board are optimistic concerning industrial peace. Left to right, Donald Wakefield Smith, J. Warren Madden (chairman), and Edwin S. Smith

understanding in a binding agreement for a definite term. Here the respondent and the Union had in the course of their negotiations achieved a meeting of the minds upon four points. The union then requested that the respondent enter into an agreement containing these four points. In our view of the act, the minds of the parties having met, it imposed upon the respondent a definite obligation to embody the understanding in an agreement. The respondent's failure to do so constituted an unfair labor practice, within the meaning of Section 8, subdivisions (1) and (5).

"We must not be considered as holding that an employer is obligated by the act to accede without more to the terms of a contract presented to him by the representatives of his employees. The act does not so provide and we make no such interpretation. The Senate report is clear on this point. . .

"Thus an employer is not required to sign the specific agreement presented to him by representatives of his employees. Nor is he obligated to agree to any of their demands solely for the sake of reaching some agreement when genuine accord is impossible although both sides are acting in good faith. But the line between these privileged areas and the duty imposed by the act is distinct; the employer must negotiate in good faith in an endeavor to reach an understanding, and that understanding if eventually achieved must be incorporated into an agreement if the representatives of the employees so request. Even that duty does not require that the employer enter into an unalterable obligation for an extended period of time, since many collective agreements contain a clause permitting termination or modification by either party upon prescribed notice. The duration of the agreement, like any of its substantive terms, is a matter for negotiation between the parties."

One of the things emphasized by the Board is the simplicity of the statute. All that is meant by the provision preventing unfair labor practices, it is stated, is that employers may not evoke their right of discharge for union activity or affiliation; that they may not coerce employees into joining a company-dominated organization, or that they may not refuse to bargain with a representative their employees may have chosen.

Incidentally, Chairman Madden is in a position to lay claim to the full regalia of a prophet because in a public speech before the Congress of American Industry in New York, December 5, 1935, he set forth the reasons for his conviction that the Supreme Court would hold the Wagner Act to be constitutional. In that speech made sixteen months before the decision was handed down he pointed out that railroad employees had been upheld by the Supreme Court in their right to self-organization. He pointed out that it was reasonable to suppose that the Supreme Court would approve just as completely a similar right to all labor on the ground that strikes in industries stand in a current of interstate commerce and not only affect the current but frequently stop it completely—at least for a time.

Next major C.I.O. objective? A view of the Ford Motor Company's River Rouge plant at Dearborn, Michigan

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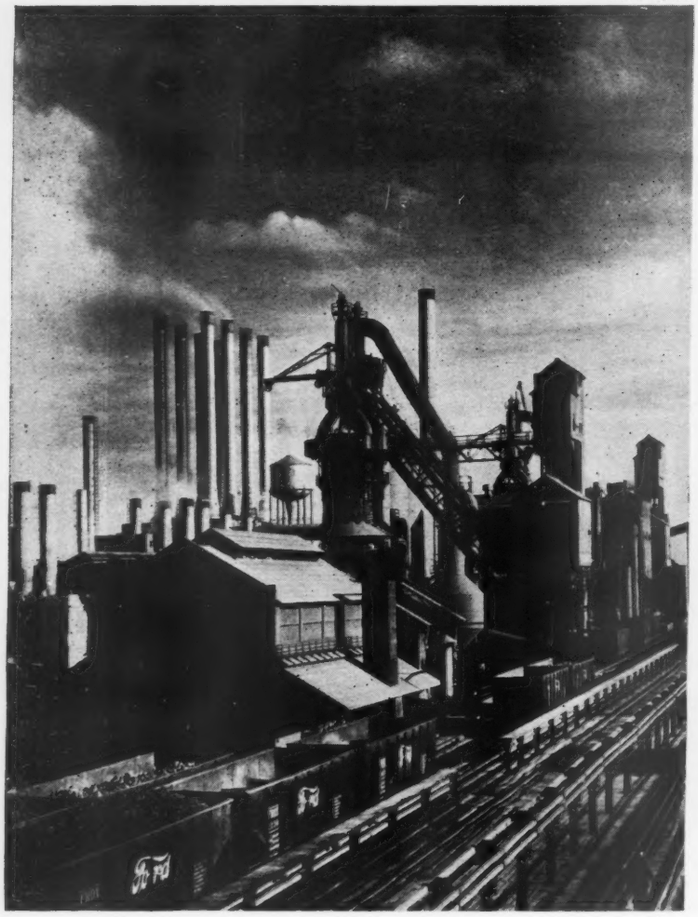


AT EVEN an earlier date, before the Labor Institute at Pittsburgh, he said: "It is of the essential nature of streams that they are continuous from source to outlet." He was discussing the decision in the Packers and Stock Yards Act.

"Since a strike of packing house employees," he said on that occasion, "would stop the flow of animals into, and of products out of, the packing plant, it would stop a stream of interstate commerce. The federal government which has the power to protect such commerce would seem clearly to have the power to apply remedial measures, such as the Wagner Act, to prevent such a strike."

Then he asks, "Is not the flow of commerce in iron ore and its products, for instance, as definitely a current as the flow of steers? Strikes in steel mills dam up or dry up a stream of interstate commerce. Does not, then, a congressional regulation designed to prevent such a catastrophe come within what Chief Justice Taft said in the Swift case was one of the chief purposes of the Constitution—to protect and to control these ever-flowing streams of interstate commerce?"

Headed for the Bowwows?

Not a bit of it, reports *Factory's* labor editor. No reason, he says, why anybody should get the crying jitters. On the contrary, the stage appears to be set for closer cooperation between employers and employees

FRANK RISING
Labor Editor, Factory and Business Week

THERE'S some thinking about labor going on in America these days. Not just talking—we've always had plenty of that and still have—but hard application of reason. And the amount of honesty, patience, and perseverance now being expended by management, labor, and government bulks large enough to hearten any observer who thinks we're going to the dogs.

Getting the "feel of things" involves digging into fundamentals with those who speak for business, big and little; for labor, organized and unorganized; for government, federal, state, and local. Further, and probably more important than any of these, it involves the careful scrutiny of opinions voiced by the average citizen—the man in the street. He's thinking, too, and in the main he's hopeful, optimistic, fairly free of jitters.

Closer Together

Strangely enough, after the crashing echoes of sit-downs and other major disruptions have died away in our industrial centers, management and labor seem closer together than they were before. The violent explosion often does great damage, but the blast knocks inhibitions aside and shreds a lot of red tape. By forcing employers and employees to examine each other's problems, it sets the stage for closer cooperation and mutual understanding.

Can't you do that without strikes? A large part of America thinks you can. The trend today undoubtedly is toward mediation before strikes, not afterward. And minor problems that used to cause sit-downs are being settled without disturbing the production line.

Take Akron as an example. Akron already has been through a lot of trying experiences which just now are bothering other cities. On any working day the plant managers, industrial relations men, and foremen are grappling with innumerable questions of wage rates and working conditions. They make a slight adjustment here and there, "save face" for the union official now and then, argue reasonably with the boys in the shop when the latter are wrong.

In Akron they are even making accountants of some of the union men. Telling the whole story of how basic rates are built, the managers open the eyes of many a workingman who theretofore hadn't the slightest conception of an office worker's problems. The local union officials thereby not only start on the road to wider education but they also have some facts to carry back to their group. Maybe they didn't

International News

Not much fire at Hershey. But a lot of smoke. The recent ruckus was not at all the uprising against the "reds" that so many people thought they saw in it. The farmers were just determined to sell their milk, simply wouldn't have anybody messing around with their market

get an increase—but they know why. They've gained more confidence in management, and they've gained some pride in their own ability to think things out.

Management in Akron, on the whole, is doing a tremendous job. So are some of the unions—a point which management readily admits. When the Firestone strike began a few weeks ago, the union went to local dispensers of liquor and asked them not to serve whiskey to non-working rubber tire builders. The union used to rail at the employers as "slave drivers" and threaten them with dire fates. What now? C.I.O. officials in Akron will tell you that the "biggest man in the United States" is so-and-so, and when you look him up you'll find he is an employer. Ask them why they think that way and the answer is simple: "He never once has lied to us. And he's got the toughest job there is, handling rubber workers. Tire builders are tough babies."

In the rubber center there still are labor problems aplenty, and they are far from out of the woods—the rising spiral of rents and commodity prices catches up with rising wages and passes them in spots; life is no joy complete. But disaster and catastrophe simply aren't in the picture, if the majority feeling of the town is any indication.

Growing Pains

Other cities have other situations. Detroit has been through hell, and every citizen who can read the daily newspapers knows it. But the air is clearing there, too. The unions have growing pains. They've got a curse of "amateur union leadership" which is still not eradicated in Akron and probably will last for a long time in the automobile capital. When a local union springs into the spotlight, its local officials suddenly become big men. Sometimes their feet leave the ground; they try to be executives and feel it a signal weakness if they can't answer any question. Where a wiser man, older in the job of directing others, might temporize and figure it out, the new man is apt to yell "Shut her down!" and figure it out later.

That's only part of it; there are soap-boxers to deal with, too, and some of them are hard to handle. Unions find them hard to handle, even as employers do, and today a great C.I.O. problem is the replacement of these fast-talking, politically inclined men with more sober industrial-minded executives. In Detroit the unions know this very well.

City after city is witnessing the scraps within unions and between unions, in addition to the employer-employee debates. Jurisdictional fights between A.F. of L. craft unions and C.I.O. industrial unions are bitter; even though many of them are pretty well under cover. Each is working to undermine the other, to sign up a majority of the men.

International News

On April 24, in an election ordered by the National Labor Relations Board, Hershey employees voted 2 to 1 against C.I.O. affiliation

Chief advantage on the side of A.F. of L. is its greater percentage of skilled workers, which means a greater percentage of intelligence. On the C.I.O. side, the advantages in many cases are strong enough to outweigh the Federation's strong points—the cross-word puzzle craze was nothing to the sweep of emotion that is carrying thousands of workers into the C.I.O. camp. And the impartial consensus is that the A.F. of L. "started too late"; that C.I.O. raids which have carried several Federation unions into the industrial unionization camp will continue to be successful and thus will add the craftsmen's intelligence to its already tremendous weight.

Big cities haven't any monopoly on labor problems. Hershey proved that. And Hershey is worth the scrutiny of every citizen in the country. Best-managed town in America, with a maximum of social and recreational advantages for its people, apparently closer to Utopia than any other industrial center, it was hit over the head not only by a strike but also by a riot.

What was wrong? Didn't the workers appreciate Mr. Hershey's generosity? Of course they did; many of them revere him as a man of godlike qualities. But they wanted more pay. They organized, and got a couple of raises, agreement for a 60¢ minimum and a 40-hr. week. Seniority rights, too.

Then why the sit-down? The answer is simple. When lay-off season approached, the company finger pointed at the new union committeemen. That looked like unfair tactics to the organized workers, and they got sore and sat down. Then they were evicted by farmers and other workers, and another grievance grew from the beating-up of the sit-downers. Now there was some bitterness on both sides.

But Hershey on the whole is sane, honest, and frank. Even after the strike there was little disposition to truculence. The company likes the workers, and the workers like the company. In the nation at large there were various misinterpretations of the facts, but Hershey knows what it is all about and isn't going to have any revolution.

Oddly enough, the action of Pennsylvania farmers in Hershey caused most of the country to see fire where only smoke existed. The average man said: "There's your answer. The farmers are rising against these reds who are wrecking our urban industries." Editorial writers everywhere speculated on the deep schism which had appeared between "two great classes." And so on.

Fact is, the farmers who cleaned out the Hershey plant are a closely united lot, and they simply won't have anybody messing around with their milk market. In 1934 they were ready to take the Hershey management to a cleaning, when the company declined to meet the state control board's price scale on milk. That was settled when the company backed down. The recent ruckus was settled when the strikers backed down. And the farmers went back to farming—not much interested in involved discussions of political, economic, or social philosophies, just determined to sell their milk.

To Sum Up

For the sake of space, and because the problem city-by-city varies usually only because of difference in company names and by varying percentages of the ingredients to dispute, we can sum up industrial America like this:

1. Organization of labor not only is coming fast, it is coming backed by majority opinion.

(*Continued on page* 86)

With Never a Post Mortem

Three-man plan provides cost and production control in 300-man job-order plant. Wastes neither time nor money on the 85 per cent of orders that go through without a hitch, shows up only the exceptions that need attention

W. A. BARR
Vice-President and Factory Manager
Foote Bros. Gear & Machine Corporation
Chicago

SIX OR SEVEN years ago Foote Brothers laid out a general program of development whose various steps have been worked out only one by one. One of these steps has been the development of a combined cost and production control which has now been in operation long enough to have proved its value.

Gear manufacture is with us a special-order business in which accurate estimates and bids are the foundation of profits. The plan enables us, the year round, to keep actual labor costs within a per cent or two of estimates by bringing any variation to the immediate attention of the factory manager.

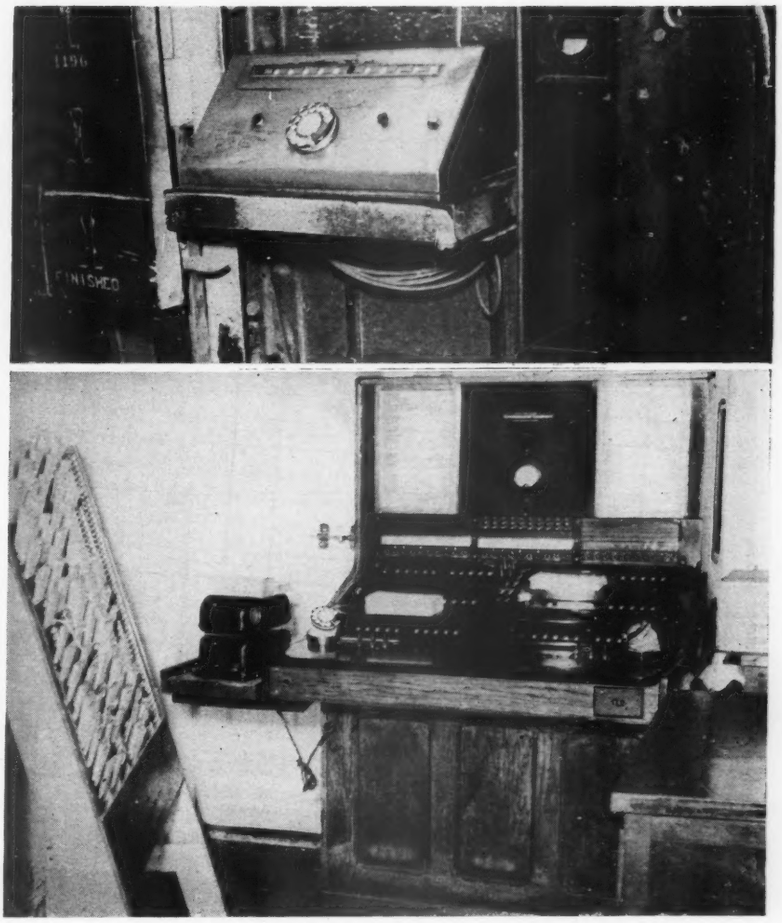
The plan provides real cost control, not just a post mortem. Whereas the usual job-order cost plan gives no information until after—sometimes months after——the whole order is shipped and beyond mending, our plan provides immediate notice of any variation from estimated cost. Within an hour of the completion of an operation, or of the first batch of a large lot, the foreman is notified of the variation and can often stop what might otherwise run on to a large loss.

Cheaper to Operate

The new plan is much cheaper to operate than the old. With three good production men we now get better control than had previously been possible with seventeen department timekeepers and several additional clerks. Then, too, attention is given only to the exceptions. For the 85 per cent of orders which normally flow through the shop without special supervision and detailed production control, we need not spend time and money in an elaborate control which is not needed.

A big factor in the clerical economy is the shifting of production control almost entirely to the foreman. The foreman possesses, as a byproduct of his other duties, a more accurate and timely knowledge of conditions in his department than can possibly be had by anyone else. To transmit all this information to a scheduling clerk, and then back again as an order, not only multiplies clerical costs but also slows production and introduces occasions for errors and inaccuracies.

Where scheduling decisions are centralized, the result is usually that the foreman does not have the facts. Although it is admitted that he makes good decisions for his own department, it is contended they may be very bad ones from the standpoint of the customer, or of other departments. In our 300-man shop, we have found it possible to get information to the foreman effectively



Important part of the cost and production control plan is the dialing station (above) from which each operator signals the production clerk details of job just completed and of job just begun. This information is automatically registered at the central station shown in the lower illustration

through a daily meeting. Thus we take the facts to the foreman, rather than the decisions to a central department.

A central record enables the progress of an order to be ascertained at any time. There is little follow-up; this is taken care of in the morning meeting. The resulting shortening of the path of action and the direct placement of full responsibility on the foreman are to everybody's advantage.

Our plan does somewhat increase the duties of the foreman. But we have subdivided supervision to an extent that prevents loading him too heavily. Under the factory manager are three production men who keep the necessary records and attend to follow-up, and three general foremen. Under the general foreman are working foremen, each responsible for a department and each dividing his time as necessary between supervision and production. Thus we get a wide diffusion of supervision without a corresponding increase in burden costs.

Probably the ability to make his own plans, without the formalities incidental to central scheduling, reduces the demands on the foreman's time rather than increases them. Certainly he feels a greater sense of responsibility, and more freedom for getting results in his own way.

To get a clear idea of how the plan works, let us follow it through in detail. When an estimate is requested by a customer, the job is analyzed on the form illustrated in Figure 1. Referring to data accumulated by time studies and checked by cost experience, the estimator enters on this form the allowed time for set-up and performance of each operation. These times are extended to give labor costs. To these costs the necessary percentages will be added for overhead and profit, and costs for materials and special items will be estimated. Estimating is responsible work. The production of good estimators is one of the most important training problems.

If the bid is accepted, the estimate is drawn from the files and a "roughing sheet" (Figure 2) is prepared. This sheet shows virtually the same detail of allowed set-up and unit operating time as the estimate. A hektographed master copy is typewritten from this rough copy. It is reproduced in sufficient numbers to supply each department concerned with a copy. Extra copies and the original are retained by the production department.

The original is folded and filed by the production clerk in a standard visible card file. The back of the original order (Figure 3) contains columns for the entry of labor costs, and for a record and follow-up of purchase orders and deliveries. When these deliveries are complete, the job is started through the shop. One copy of the order travels with the materials to completion.

The job that we have been following is now at the first department in which the work is to be done. The foreman there assigns jobs in order of importance.

Starting the Job

When an individual operator is ready to start a job, he steps to a dialing station in his department and signals the production clerk. This dialing station is one of several connected to a central board in front of the production clerk, thus putting him in communication with all departments. It is operated like an automatic or dialing phone. The dialed information appears on a register on the central board.

Having signaled the production clerk, the workman dials his own number, the number of the job just completed and quantity made, the number of the job on which he is just starting, and the number of his machine or production center.

The production clerk who has been receiving this dialed information copies the job number and man's number on a blank time card from

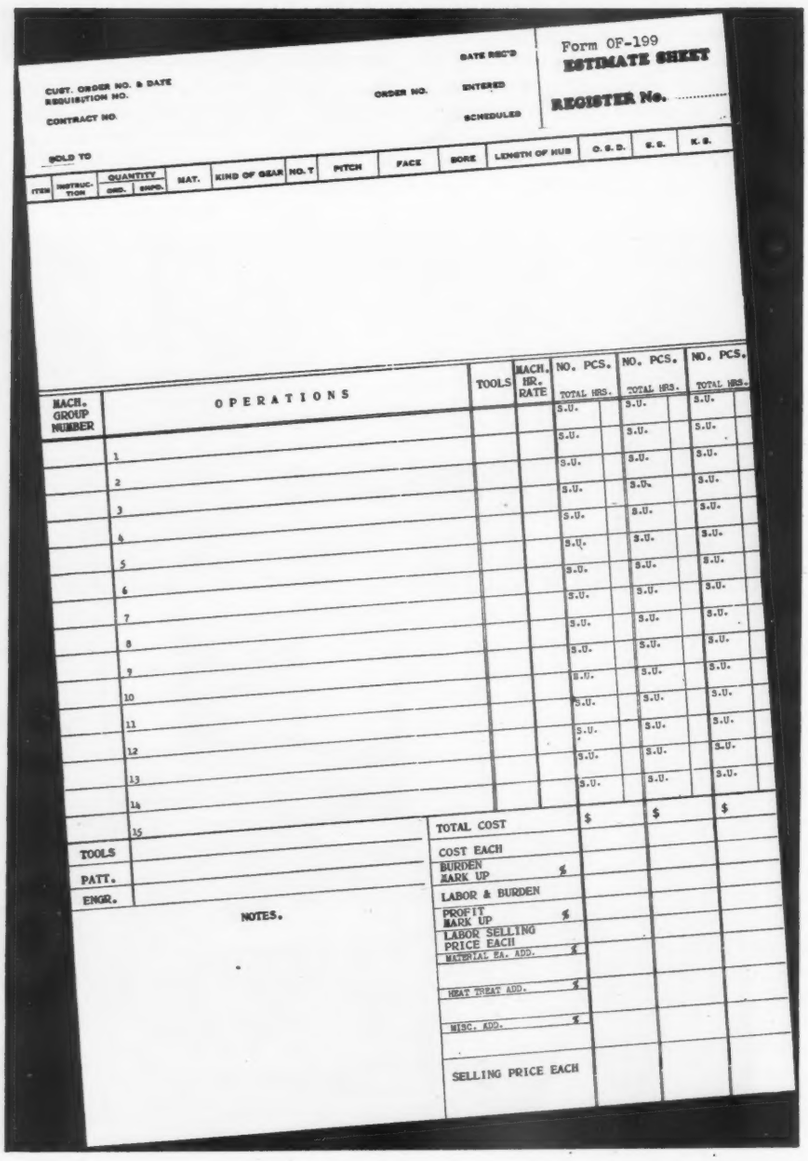


Figure 1. When an estimate is requested by a customer the job is analyzed on this form

the register before him. He stamps the starting time. For the old job, he gets out the corresponding time card, stamps the finishing time, and enters the quantity completed.

Between calls, the production clerk has time to turn to his visible file of jobs in work. For the job just completed he enters on the time card the allowed time for the number of pieces finished. He compares this with the actual time. If there is a substantial unfavorable difference, he gets out of his files an extra copy of the production order and notes on this a report of the variations. This report goes at once to the factory manager, after which it is sent to the foreman involved, making possible the immediate control which is so valuable a feature of the plan.

If the work has been routed to the wrong machine, or tools are lacking, or any other trouble develops, this plan brings it to light. The copy of the order that travels with the jobs shows the time allowed for each operation. If the workman knows that this allowance is insufficient, he usually reports the matter himself before he starts the job, because his bonus depends on meeting the allowed time.

Cost Summary

Meanwhile the production clerk posts the details of the completed operation in one of the columns provided on the back of his file copy. This provides both a cost summary and an up-to-date progress record.

The time card is in triplicate. One copy of it, folded beneath two carbon copies, is a standard tabulating machine card. These cards go to our tabulating department which punches them in accordance with the data and makes up all the reports and analyses needed by the company.

One of the reports of special interest to the factory manager is a summary showing total actual time against allowed time for the week by production centers and departments. Because standard time is estimated time on which selling price is built, the relation of actual time to standard time on this weekly report gives a complete check and control of costs.

These features of the plan give the *cost control.* The heart of the *production control* is a daily meeting of the factory manager, production men, and foremen in the production office. At this meeting all the records are right at hand. Each foreman comes to the meeting with his copy of the latest schedule sheet, ready to cross off on it operations finished, and to mark new dates and delivery promises.

At a fixed time daily the executives of the company hold a meeting where there is a check-up of every job calling for special delivery requirements. Stock is taken of inquiries unanswered in sales or engineering department and of complaints over two days old. Everybody goes back to his own job with a picture of the general situation and of particular trouble points.

We are still developing and changing details of our plan. But it has, to a very satisfactory degree, disposed economically of routine details, freeing our supervisors for action on essentials. It has given us a positive control of costs we can depend on. It has helped every man in the organization to know what his responsibilities are, from hour to hour, and has helped him to meet them. The plan thus provides the practical, factual basis for the kind of teamwork that is the special strength of the small, compact organization.

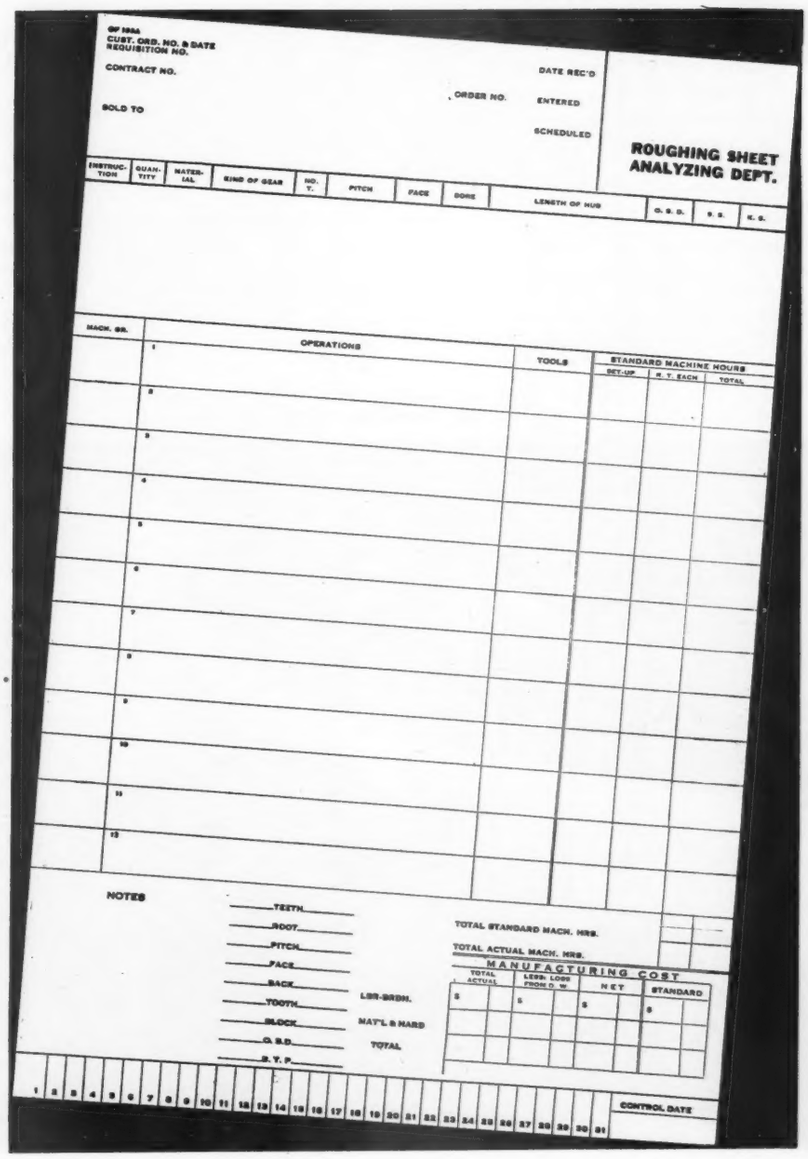


Figure 2. If the bid is accepted, the estimate is drawn from the files and this "roughing sheet" is prepared. A master copy of this sheet is then made and hektographed in sufficient numbers to supply each department concerned with a copy. Original is filed by production department; one copy to each foreman; one copy accompanies job; one copy for production clerk's report of variations of actual from standard times. On the reverse of this hektographed order, columns are provided for entry of labor costs, and for a record and follow-up of purchase orders and deliveries

Handle Less, Earn More

HAROLD C. PLANT
Time-Study and Methods Department
Westinghouse Electric & Manufacturing Company
East Pittsburgh

Two bar-stock storerooms became one. Better handling converted two-man to one-man jobs. Cut-off costs are 25 per cent less by the new method. Pay envelopes are fatter

CHANGES in organization policy at our East Pittsburgh plant resulted in the discontinuation of a central storekeeping department. The main works storerooms were distributed to the several manufacturing departments with each storeroom under the supervision of the department that used it most.

Following this distribution, one of the manufacturing departments obtained supervision over the main bar-steel storeroom as well as over its own bar-steel sub-storeroom. Extensive cut-off work was performed in both places with power hack saws. However, it soon became evident that no reason existed for maintaining two storerooms. In planning their combination, a study was made to find out how the cost of cut-offs in general could be reduced.

In both storerooms all cut-off operations were carefully analyzed. They were then divided into two categories—those that could be eliminated altogether and those that could be modified to require less time. This analysis showed the following possibilities:

1. Use of operator's time during saw cut.
2. Better handling of billets from main storeroom to sub-storeroom on mezzanine floor.
3. Better handling methods for material at saws.

In the main storeroom it was necessary to maintain a minimum personnel to handle periodic peaks in the daily production load. These peaks were especially severe when many small bars had to be cut, because the cutting time was short in comparison with the handling time. However, when large bars predominated in the load, the ratio of cutting time to handling time was high, resulting in considerable lost time after all saws were loaded and cuts started. This condition made it imperative that part of the cutting time be included in the standard time values allowed for cutting off bar stock. To an even greater extent the same conditions prevailed in the sub-storeroom where bars of large cross-sectional areas were cut. There the work was of such a miscellaneous nature that it could not be placed on an incentive basis.

The combined load of both storerooms was such as to smooth out the peaks of the production load to a considerable extent, enabling the sawyers to utilize their time productively. Furthermore, the grouping of all saws in one location, where they could be operated by a minimum personnel, practically eliminated those occasions when all saws were cutting large billets and the sawyers were left without available equipment upon which to spend their time usefully. A greater number of saws per man assures far better flexibility. Standard time allowances are now based on handling time—no cutting time is necessary in the values.

Roller conveyor sections now make a one-man job out of bar handling at the cut-off saws

Easier and Faster

Handling operations around the saws themselves were speeded up and made easier. Setting a piece to length formerly required the services of two sawyers whenever the bar was a long one, and in excess of 5 or 6 in. in diameter. The only alternative was for one man to work first at one end of the bar, then at the other end, driving the bar back and forth with a heavy section of bar or sledge hammer until he had the proper setting for his cut. This awkwardness was due to the use of pipe-stand bar supports that were

equipped with crude rollers and bearings of very high frictional resistance. Sections of roller conveyor with anti-friction bearings in place of the pipe-stand bar supports now make it possible to move long, large-diameter bars with comparative ease.

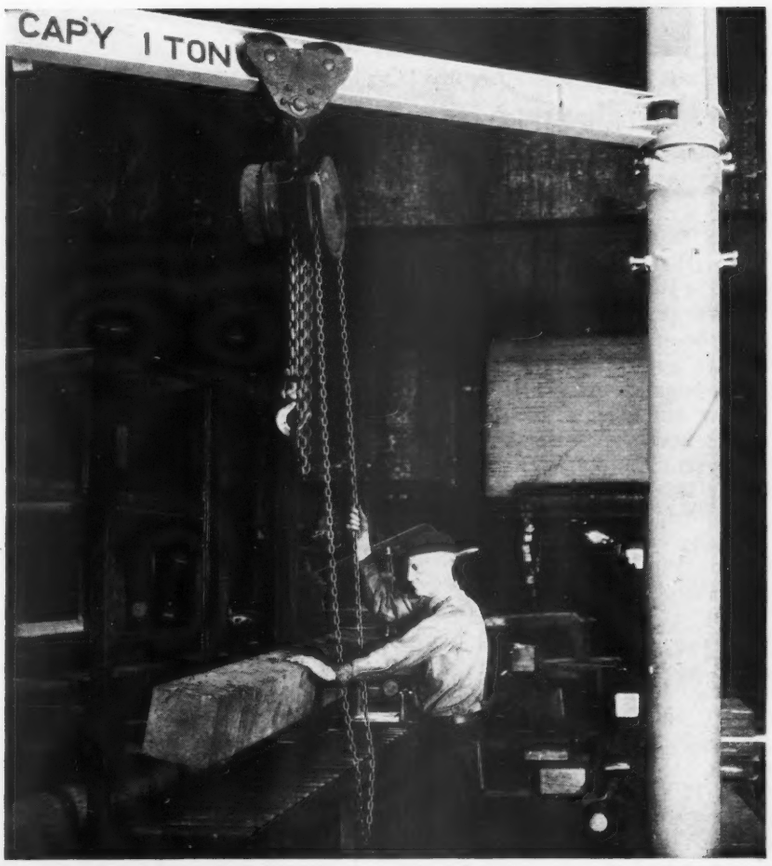
Another desirable result of moving the sub-storeroom into the main storeroom was the reduction in transporting bar stock. The sub-storeroom was located on a mezzanine floor at a considerable distance from the main storeroom. Material was hauled either by electric truck or by narrow-gage industrial railway from the main storeroom to the sub-storeroom. Transfer was made to an elevator, and thence to the mezzanine floor. (No overhead crane service was available on the mezzanine floor, and a jib crane was not practical because of limitations on operating arc, boom length, head space.)

Simplified Crane Service

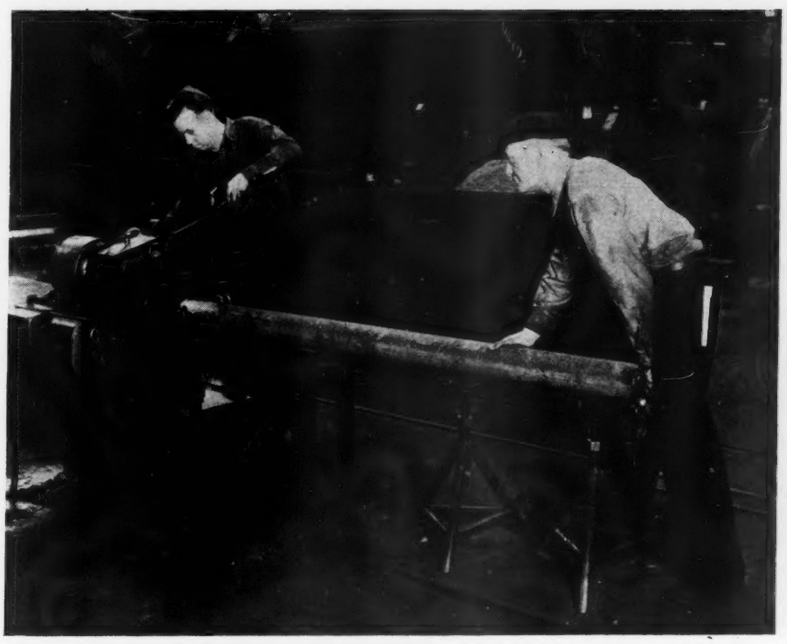
Overhead crane service in the main storeroom was greatly improved. The sawyers were often forced to wait long periods for a crane lift when handling bar stock of large cross-sectional area. This difficulty was largely the result of a divided crane service between the storeroom and another department located in the same building and under the same crane runway. It was considered imprudent to maintain two cranes in operation because the demand for crane service was not heavy enough to keep two operators occupied. Installation of a pedestal-mounted jib crane equipped with a long boom offered a practical solution of the major part of this handling problem. Those saws which were used for large work were arranged adjacent to the jib crane and within the range of its boom.

Use of the jib crane had three important results. First, crane waiting time was practically eliminated, only the extremely heavy billets being handle by the overhead crane. Second, bar handling was converted from a two-man job to a one-man job. Third, the crane operator was released to another department needing his services.

Revision of layout and handling has resulted in a direct 25 per cent saving of cut-off costs. In addition, the move eliminated duplication of records and of standard stocks and reduced the scrap ratio by decreasing the number of short ends. Of no small importance is the fact that a real incentive is now open to the personnel on the saws. Whereas their efforts were formerly restricted by the limited number of saws per man, they may now devote their entire time to productive operations with corresponding increases in pay.



Jib crane serves saws that handle heaviest work, practically eliminates crane waiting time, converts bar handling from two-man to one-man job, releases crane operator to another section of the shop



Used to take two men to set pieces to length. Reason, pipe-stand bar supports with crude rollers

It's this way in Washington

Harris & Ewing

Who says this year's corporation earnings will not be taxed at a higher rate than is now written on the statute books?

CARTER FIELD
Washington Correspondent

PRESIDENT Roosevelt's insistence that there will be no new taxes this year, and the violent opposition of House and Senate leaders to any boosts are all very well—but they are not conclusive. Far from it. So business men may well ask:

"How much more of *this year's* incomes and corporation earnings is the government going to take in the March, 1938, returns, than present rates provide?"

No one can be sure, but in considering the answer there are two pertinent elements.

First is the question whether President Roosevelt can really cut relief appropriations more than $800,000,000 for the fiscal year beginning July 1 next, and, far more important, whether he will prove willing to do it even if it is possible. If he can and will, then it is quite possible, in fact probable, that levies on the earnings and incomes of the calendar year 1937 will remain as they are now.

If the Expected Happens

The second pertinent element concerns possibilities if the expected happens and relief expenditures are *not* cut anything like the amount the President now proposes. Congress must then determine, next January, whether or not to make the new tax levies *retroactive*.

For, make no mistake about it, it is unthinkable that relief expenditures continue uncut and taxes continue unraised—that is, so long as the President maintains his strong feeling against printing-press money, and he is not apt to change in that direction, being far less variable and changeable than he is sometimes pictured by critics.

Assuming relief expenditures are not cut sharply—and scarcely anyone in Washington has any confidence they will be—it would obviously be sound policy to make the new income and corporation levies *retroactive*. But there is a catch there. Election is just at the end of the road. It comes on the heels of adjournment of that session of Congress. Every member of the House and at least one-third of the senators come up for re-election.

To predict a politician's attitude nine months in advance is an old custom among political writers, but a dangerous basis for business computations. However, it is highly significant that *at present* a large majority of both houses are frightened to death of the political consequences of another tax boost.

Even President Roosevelt himself has been impressed with this fear. He has indicated agreement with national legislators who told him that a big tax boost, especially one hitting small-income folks, might result in a political upset in November, 1938. It must be realized in estimating this possibility—which you may be very sure is given plenty of consideration by the President and the gentry on Capitol Hill—that Mr. Roosevelt will not be running. More important, there will be no *national* Republican candidate. The opposition will thus not be handicapped either by a national policy, which might help in one section and hurt in another, nor by a head of the ticket who might be popular in Massachusetts and unpopular in Illinois.

Thus the voters who have some grudge against President Roosevelt or the New Deal, or more specifically against new tax levies (or old ones, for that matter), will be free to vote the opposition ticket.

All of which is vital because, after all, politics does and *must* govern political decisions. Also, it is what the politicians *think* the people will do rather than what the people actually will do which always governs. At present politicians are afraid of a tax boost. The likelihood is that they will continue to fear it, increasingly, as election approaches.

The President, Secretary of the Treasury Morgenthau, and Congress are *all* impressed *now* with the accuracy of the theory so forcibly stated at the time the tax on undistributed earnings was forced through. Treasury experts then pointed out quietly that nearly one-half of the dividends in good years had not even been reported in individual income tax returns, much less figured in tax payments. These experts were not surprised at the failure of the income returns of March 15 to live up to official estimates.

Officials are also impressed with the efficacy of the law of diminishing returns when it comes to boosting rates too high on big incomes. Tax-exempt bonds are too prevalent. Purchase of temporarily non-productive property as a hedge against inflation is too attractive. Disinclination to go into gambling ventures when the government takes most of the profits but does not share in the losses works the same way.

Simplest Political Target

So there are two strong probabilities when it comes to getting that revenue which, so probably, must be provided for right after Christmas. One is the politically terrifying but very rich field of small incomes. The other, which concerns business men acutely, is that the corporation still stands out as the simplest political target. It must do business to keep going, and, with government supervision of its books, its disbursements, and its labor relations, it cannot escape. Up to now there is no evidence of what might be called a stockholders' bloc in the electorate. There is no record of a senator or member of the House ever having been beaten for re-election because he voted a higher tax on corporations.

And, incidentally, this course also falls in line with the President's constant desire to effect social and economic reforms through the tax route, and with the desire of some of his advisers to work towards government ownership.

Profit Sharing Is Probably Not the Thing to Do

Wage earners are not pioneers. They cannot and do not want to become risk takers. Yet that is exactly what the payment of wage bonuses contingent on profits makes them. This article presents a slant on profit sharing that is sure to be new to most of us. It is unsigned because the author wishes to preserve his status as an unbiased observer rather than to appear as definitely advocating or opposing any specific plan or method

DESPITE the distinctly unfortunate experience that many companies and their employees had with employee stock purchase plans during the recent depression, a similar movement for employee profit sharing is already gaining momentum. Phoenix-like the idea of making enterprisers out of wage earners is arising from the ashes of disillusionment. Managements are again making the mistake of assuming that workers, like themselves, are pioneers at heart, looking aloft to the mountain peaks of business success rather than remembering the deep valley of unemployment and insecurity which many have just left. The efforts of the wage earner to regain a secure and stable livelihood are again being confused by tempting offers of contingent profits and bonuses which put a premium on wishful budgeting.

Reward for Risk

It is a basic principle of the capitalistic system that the risk-taking function is assumed by the enterpriser. As a reward for risk, the enterpriser receives profits—a noncontractual share. The wage earner has traded his claim upon windfall returns for a stable income which approximates a moving average of his value to his employer's business.

This division of function and rewards is fundamental to the capitalistic system. It is one of the contributions of the system to economic evolution. The great majority of working people cannot and do not want to become risk takers. The capitalistic system, aided in more recent decades by the growth of the large corporation, has offered a means of assuring a stable income to the worker. An owner group with diversified investments, many have hoped, would in increasing degree assume the risk of business and thereby equalize the flow of wages.

But with the spread of stock ownership in the decade following the War, many managements have sought to reverse this process. They have attempted to stabilize dividends at the sacrifice of stability in payrolls. Lay-offs and wage reductions have occurred while dividends were maintained. And now another step is occurring—the shift in risk to the worker in the upswing of business. Unless corporate managements check this increasing tendency to push risk down into the wage-earning groups, they will be bringing on their heads an ever more severe criticism of the much criticized capitalistic system.

Far more immediate than the undermining of popular acceptance of capitalism is the accentuation of business instability and the disturbance to sound industrial relations which widespread profit sharing would bring in its wake. The center of gravity of our economic system lies in the wage-earning population. The high average living standard of the American workman makes his buying habits and attitudes of great importance in the changing cycle of business. Economists and financial leaders in their great concern about the more tangible factors of credit, fiscal operations, and investment returns have underestimated, it seems, the momentum of mass confidence in its effect on business stability. It is probable that a reduction in the amplitude of the cyclical variations

Bonuses quickly disappear

in wage-earner incomes will do much to break the vicious circle of over-capitalization followed by under-capitalization upon which the credit and price factors of the cycle operate. With strong corporations employing an ever larger proportion of our wage earners, we should be increasingly able to take advantage of this principle.

But profit sharing operates in a precisely opposite manner and tends to accentuate the swing of wage-earner incomes. Instead of moderate, steady increases in wages which can be sustained in the face of minor business recessions, under profit sharing emphasis is shifted from wages—the more stable element in compensation—to the supplementary bonus. For this reason, *base* wages are likely to advance less rapidly. Meanwhile the worker comes to expect the continuance of the bonus payment and adjusts his standard of living accordingly. Installment selling arrangements quickly stimulate an absorption of current and expected bonuses into expanding purchases which stretch total income to the limit. Then comes business recession. Bonuses quickly disappear and a retarded *base* wage fails to sustain a continuance of the new level of consumption. Wage earners cease to provide a good market for mass production goods, and the downward spiral of depression immediately sets in.

Along with this economic reversal comes an undermining of confidence in the efficiency and sincerity of business management. Instead of a sense of security the worker feels the resentment and loss of status which accompanies a retrenchment in one's customary way of life. The car must be sold, cheaper housing secured, and plans for the education of children, for vacations, and for household improvements curtailed. Experiences of this sort cannot fail to discourage thrift, which like most habits arises in large measure out of a taste of its own satisfactions and not out of reasoned conviction. Uncertainty breeds carelessness of the future, while certainty encourages foresight.

Sound for employee, employer, and public are these alternatives to paying wage bonuses contingent on profits:

1 Spread potential bonuses into wage levels that can be sustained despite minor recessions

2 Extend salary basis of payment to as many as possible

3 Increase appropriations to pension reserves

4 Establish funds for sickness, invalidity, and unemployment benefits supplementing governmental programs

. . . sporadic hand-outs of cash at times when the board of directors is in a generous mood

There is, of course, no panacea for the business cycle. The general attack on the problem must consist of many correlated measures on the part of government, finance, and industry. Government must improve its techniques of fiscal administration. Social insurance will help. Measures for the increased stability of the value of money and of the flow of credit are vital. But industry can assist in the program in many ways. Among those ways well within the realm of practicability is the adoption of a sounder wage policy. Instead of profit sharing and rapid alterations in wage levels up and down, industry—employer and labor—can strive to smooth out the swings about a steadily rising trend. As the productivity of industry increases, wages should rise accordingly. A rigid wage structure would be unfair and dangerous. But violent fluctuations in wage flows, on the other hand, add their impact to the swinging pendulum of business. Instead of leveling the peaks and filling the valleys, this kind of wage policy makes the roller coaster all the more breathtaking until the sad moment when the car jumps the track and spills its occupants over the adjacent landscape.

Better Than Bonuses

Among the practical steps for smoothing out wage-earner incomes are the spreading of potential bonuses into wage levels that *can* be sustained despite minor recessions, the extension of the salary basis of payment to as many employees as possible, increased appropriations to pension reserves to meet accrued liabilities and current charges, and the establishment of funds for sickness, invalidity, and unemployment benefits supplementing governmental programs. Whether considered as a part of a general wage policy or as separate programs, these steps can

(*Continued on page* 87)

Halved Paperwork

R. P. FOOSE
Consulting Engineer, New York

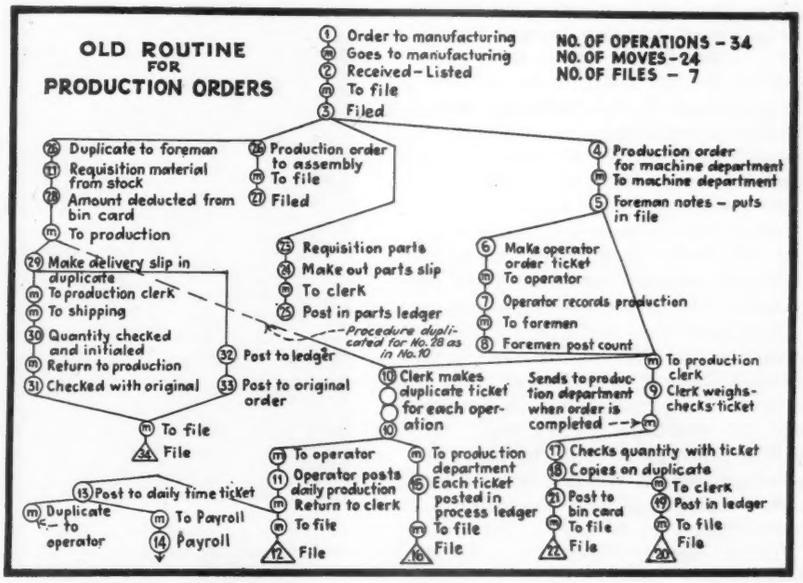
Motion economy applied to production order routine cut 34 operations to 17, and reduced 24 moves to 11

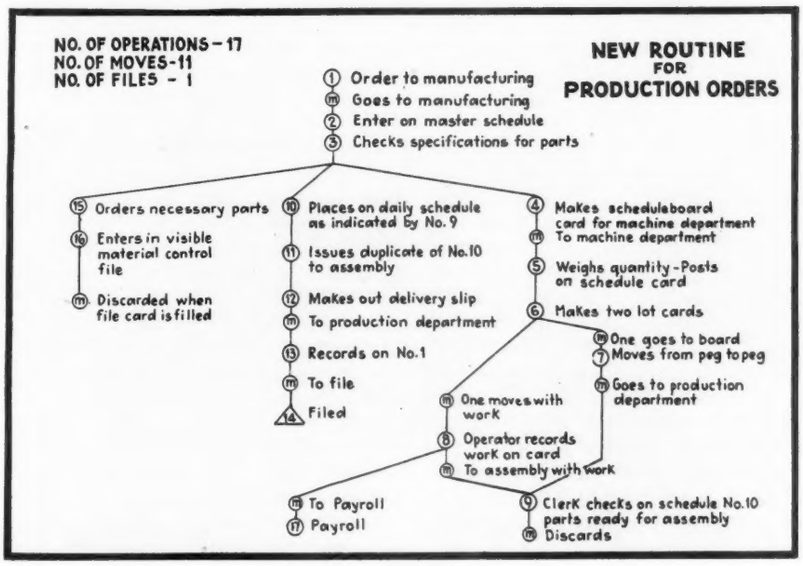
COST REDUCTIONS developed through motion economy have tended to concentrate attention on shop method improvement. There is an equally important field in the analysis and improvement of clerical routines. In fact, the work done on shop methods frequently serves to focus attention on clerical routines. The increased productive activity of a series of motion study applications puts an added responsibility on the clerical and production functions of the plant.

Delays in material delivery, wrong parts, poor quality, and other factors tending to retard the orderly flow of the work become so obvious that some immediate action is forced.

In one plant, in order to trace out the source of the production troubles, process charts were made of the clerical routines. These charts were analyzed. Each form and its movements were traced. Its elimination, combination, or simplification was studied in turn. Figure 1 shows the process chart developed for the old production routine. Forms that duplicated work with little or no justification, files that were seldom used, additional copies that no one looked at, and many other bad practices which had gradually crept into a good system were all eliminated. In their place was substituted a simple, common-sense record.

Figure 2 shows the process chart of the revamped routine. The analysis developed a one-half reduction in clerical work.


OLD ROUTINE FOR PRODUCTION ORDERS
NO. OF OPERATIONS - 34
NO. OF MOVES - 24
NO. OF FILES - 7
1 Order to manufacturing
m Goes to manufacturing
2 Received - Listed
m To file
3 Filed
26 Duplicate to foreman
11 Requisition material from stock
28 Amount deducted from bin card
m To production
29 Make delivery slip in duplicate
m To production clerk
m To shipping
30 Quantity checked and initialed
m Return to production
31 Checked with original
m To file
34 File
26 Production order to assembly
m To file
27 Filed
4 Production order for machine department
m To machine department
5 Foreman notes - puts in file
23 Requisition parts
24 Make out parts slip
m To clerk
25 Post in parts ledger
Procedure duplicated for No. 28 as in No. 10
32 Post to ledger
33 Post to original order
6 Make operator order ticket
m To operator
7 Operator records production
m To foremen
8 Foremen post count
m To production clerk
9 Clerk weighs-checks ticket
10 Clerk makes duplicate ticket for each operation
Sends to production department when order is completed
m To operator
11 Operator posts daily production
m Return to clerk
m To file
12 File
m To production department
15 Each ticket posted in process ledger
m To file
16 File
17 Checks quantity with ticket
18 Copies on duplicate
m To clerk
19 Post in ledger
m To file
20 File
21 Post to bin card
m To file
22 File
13 Post to daily time ticket
m Duplicate - to operator
m To Payroll
14 Payroll


NO. OF OPERATIONS - 17
NO. OF MOVES - 11
NO. OF FILES - 1
NEW ROUTINE FOR PRODUCTION ORDERS
1 Order to manufacturing
m Goes to manufacturing
2 Enter on master schedule
3 Checks specifications for parts
15 Orders necessary parts
16 Enters in visible material control file
m Discarded when file card is filled
10 Places on daily schedule as indicated by No. 9
11 Issues duplicate of No. 10 to assembly
12 Makes out delivery slip
m To production department
13 Records on No. 1
m To file
14 Filed
4 Makes scheduleboard card for machine department
m To machine department
5 Weighs quantity - Posts on schedule card
6 Makes two lot cards
m One goes to board
7 Moves from peg to peg
m Goes to production department
m One moves with work
8 Operator records work on card
m To assembly with work
m To Payroll
17 Payroll
9 Clerk checks on schedule No. 10 parts ready for assembly
m Discards

The two process charts show what the application of motion economy principles did to production order routine in one plant of our acquaintance — and hint at what it might conceivably do in any number of other plants, yours among them

Above, production orders used to meander all over the shop. There were checkings and postings at every turn of the long road

Left, the seven files have now become one. There are half as many operations, half as many moves — eloquent testimony to what motion economy can do to factory paperwork

That Shortage of Skilled Labor

Really exists in the metal-working industries. Has not yet become serious in others

LEWIS K. URQUHART
Associate Editor

For every five toolmakers added to payrolls in the electrical manufacturing and machine tool industries, there is one job for a toolmaker that cannot be filled. The same relation exists for machinists

"IT'S HARD to get skilled men." "How I could use a couple of really good machinists!" "I'd take on a dozen skilled operators tomorrow if only I could get 'em."

For two years or more employers in the metal-working industry have been regaling us with these and similar stories. Out of the employment offices of the National Metal Trades Association have come reports that they could place every qualified machinist they could lay their hands on.

All this has been a little confusing. With the unemployed still numbered in the millions, could it be possible that an actual shortage of skilled labor was beginning to make itself felt? Officials of the Metal Trades Branch of the A. F. of L. said no. They insisted that there was no shortage. They said that skilled machinists could be had anywhere, provided the employer would pay a fair wage and not discriminate against union men.

What were the facts? Actually, no one had any reliable figures. It looked as if the only way out was to make a sampling survey—which *Factory*, together with *American Machinist*, proceeded to do.

Accordingly, 750 questionnaires were sent out, 175 to a selected list of electrical manufacturers, 125 to a similar list of machine tool builders, 50 to each of nine other industries—food, glass, paper, pottery, printing, rubber, shoe, textile, and woodworking. With about 15 per cent returns, we feel we have enough to give a fair indication of actual conditions. Data are not conclusive, should of course be regarded only as suggestive. Failure to get a 20 to 25 per cent return, which can ordinarily be expected from a well-conceived questionnaire, may reasonably be attributed to the fact that industry does not keep as good employment records as it ought to. This appears to be especially true of the food, shoe, pottery, and rubber industries, from which the returns were negligible.

In our study of the electrical manufacturing and machine tool industries we divided skilled men into toolmakers, machinists, and machine operators. We asked how many men were on the payroll in each of these classifications, how many were added per day on the average during the last six months of 1936, and how many positions per day on the average could not be filled. We also asked what proportion of the applicants, roughly, were qualified.

From the returns it appears that during the last six months of 1936 these companies took on approximately 5 toolmakers a day, 8 machinists, and 18 machine operators. At the same time there were openings for 1 1/6 toolmakers, 1 8/10 machinists, 1 3/4 machine operators per day that could not be filled.

In other words, we may conclude that for every five toolmakers employed there is one job for a toolmaker that cannot be filled. Approximately the same relation exists for machinists. The shortage is, as you might expect, not nearly as acute in the machine operator class, where for every 12 men hired there was one job that could not be filled.

No such shortage exists in the other industries included in the study. They were asked how many skilled, semi-skilled, and unskilled workers were on the payroll during the last six months of 1936, how

many men were added in each of those classifications, and on the average how many jobs per day could not be filled.

Returns from this part of the questionnaire can hardly be regarded as anything more than suggestive. And they certainly suggest no general shortage. Most of the replies, in fact, state bluntly that there is no shortage. On the other hand, a woodworking plant found that "75 per cent of the daily need for skilled workers could not be filled, and of the applicants for skilled jobs, only 3 per cent were qualified to fill them."

One glass manufacturer with some 400 employees says "The shortage of skilled labor is amazing." Another in the same industry who employs 110 people states that 50 hours of overtime are needed each day to offset the shortage of skilled labor. And from a printing establishment with over 3,000 employees comes the eloquent statement, "There is a shortage of skilled help!"

On March 18 the National Industrial Conference Board announced the results of a somewhat more comprehensive study. It, too, was divided into two sections. Of 404 metal-working companies who replied, 21.4 per cent reported no skilled labor shortage, 26.5 per cent indicated that a serious scarcity of such labor existed, and 52.2 per cent found it impossible to secure competent craftsmen to fill jobs that were open. This last group of 211 companies would employ a total of 7,158 additional skilled craftsmen if they could be found.

Data for non-metal-working industries were based on 55 companies. Only 8 reported an actual shortage of skilled labor; extreme scarcity of certain types of labor was reported by 21; 26 found no shortage. Total number of craftsmen needed was only 0.18 per cent of the number employed, as compared with 1.53 per cent in metal working.

In the *Factory-American Machinist* study, companies were asked what measures were being taken to combat labor shortage. Answers to this part of the questionnaire were distinctly encouraging.

For example, nearly 70 per cent of the concerns that replied are training apprentices. That, we submit, is an astonishingly high percentage. About one-third of them are cooperating with local technical high schools or trade schools. More would be doing the same thing if there were such schools in their neighborhood.

The old vestibule school of war days is not being revived. Only three or four concerns are using that particular method. About the same number are cooperating with other companies.

On the other hand, three-fourths of the companies that replied are upgrading their men. And about 30 per cent of them are doing something definite about retraining older men. It looks as if industry were not so hard-boiled as some people would have us believe.

One-third of the companies found it necessary to supplement their own manufacturing facilities by letting some of their work out. And 4 out of 5 reported that they were adding new equipment as needed, and modernizing their plants as fast as possible.

Chief cause of skilled labor shortage may be traced to the discontinuance of apprentice training programs. Chief hope of overcoming the shortage lies in their revival. It is encouraging that 70 per cent of the companies that answered the Factory-American Machinist questionnaire are training apprentices

Shortage May Yet Be Serious

Neither the *Factory-Machinist* nor the Conference Board survey is presented as conclusive evidence that there is a serious shortage of skilled labor. But both surveys do indicate that there was a shortage—and an appreciable one—during the latter half of 1936 in certain branches of the metal-working industry. Obviously, the shortage is bound to attain more serious proportions as business improves. As yet, it has not made its appearance in other industries, may never become as serious as in the metal-working industry. That there will eventually be some sort of shortage in these other industries is, however, definitely in the cards sometime between now and 1940 if business continues to get better.

Under the circumstances it is encouraging to find renewed interest in apprentice training programs. There is plenty of room for much more of the same. Industry has always had a training job to do. Never has the job been bigger than it is right now.

Sit-down strikers? No, just a benchful of girls sitting around and waiting for materials that someone failed to deliver. Hygrade Sylvania's system of reporting mistakes or failures aims to stop this sort of thing from ever happening

Exit the Buck Passer

R. E. SMITH
Production Engineer, Hygrade Sylvania Corporation
Salem, Mass.

Dead as the dodo is the old army game at Hygrade Sylvania. It passed out when the "Mistake or Failure Report" came in

MISTAKES in industrial work are costly. And because they represent a definite cost factor in manufacturing, they should be subjected to the same analysis to which other cost factors are subjected.

Industrial management, however, does not seem to take this attitude. The general attitude following a costly mistake is, "Well, the damage is done. No use crying over spilled milk." Minor mistakes are regarded as inevitable.

Why does this condition exist? Because the human element is involved, and many factory executives who are accustomed to handling thoroughly and decisively all analyses of a material or mechanical nature are just a bit afraid of the psychological feature of mistake analyses. When asked why they don't get to the bottom of such mistakes and find the reason and place the responsibility, they will mutter, "Oh! I don't believe in that. The mistake has been made. Why try to pin it on someone? We're all human, and we all make mistakes."

There's a lot of common sense in that, of course, but it has been found that responsibility can be placed without encountering any great resentment or creating the notion that anyone making a mistake in the course of his work is to be condemned to perdition or subjected to the threat of being let go.

The secret of handling mistake investigations is to treat them in the abstract—to study them as you would study any factory cost problem. If the foreman has made a mistake of judgment, he should be shown just why his decision or his method of handling the matter was wrong. Certainly someone should learn something from a mistake.

Three years ago we inaugurated a "Mistake or Failure Report" system. This was done primarily to expose conditions that pave the way for losses in production, labor, and material, and above all to correct the causes wherever possible.

In the beginning we had the same timidity and the same fears that other manufacturers have — namely, the fear of having our organization believe that the system was designed to find "goats" for each mistake that was made. But the fact that we have operated this system for three years, and the fact that its very existence is entirely dependent on the cooperation of the organization proves that our fears in this direction were groundless.

We want to make it clear that the word "mistake" should not be interpreted solely as a "blunder." A mistake or a failure as considered in our system does not always mean a careless error or a distinct error of judgment. Such apparently remote things as a delay in supplying raw materials or a breakdown of equipment are included as a "failure" under the system we operate. We regard them as factors retarding production, and they are failures to the extent that someone in the organization is definitely responsible for seeing that materials are delivered to the machine on time and that machines are maintained in workable condition at all times. The failure, then, has been in not performing up to the limits of assigned responsibility.

Regarded distinctly as mistakes of the blunder type are such major mistakes as using wrong parts, wrong set-up of equipment, violation of any standards or engineering specifications, and clerical errors in engineering data or production schedule.

Signature Is Confession

The Mistake or Failure Report (Figure 1) is used for reporting mistakes or failures. It is the duty of the first person discovering or noting the mistake to fill in one of these forms and send it to the Standards Department. As a rule, the person adversely affected by the mistake originates the report. The Standards Department then takes it up with the person who apparently is responsible, and makes a careful study of all the circumstances. If the one who is responsible for the mistake readily admits it, he is simply asked to sign the report according to the routine outlined in the Standard Practice Notice that was issued on the subject.

Each form is kept, and at the end of the week the mistakes are listed in a Weekly Summary (Figure 2) allocating each to the proper de-

partment. These summaries allow comparisons with previous periods and comparisons between departments. From the weekly summaries are compiled a quarterly summary.

An important feature of the whole system is the fact that little executive pressure is necessary in clearing up a condition that has caused a mistake. The individual signing the mistake report, acknowledging the responsibility for the mistake or failure, figuratively "kicks himself" for allowing himself to get into such a position. The natural result is that he analyzes all the circumstances in order to guard against a repetition.

Sometimes the investigation of a reported failure exposes the cause to be a fault of the departmental set-up rather than the personal fault of any individual in the department—in other words, the fault of the management. Believe it or not, in such cases the management is charged with the mistake. Even the Standards Department, which operates the system, is obliged to sign mistake reports made out against itself!

The allocation of mistakes by departments, which appears on the weekly and quarterly reports, is a valuable aid to the management. For example, when the report discloses the fact that a great percentage of the mistakes or failures have occurred in one department over a period of time, conditions are studied to find out what is wrong.

A Check on Management

Changes in methods and systems or even organization are inaugurated when such conditions are definitely discovered, and the set-up is made as fool-proof as possible. It can be seen in cases like this that one of the most important functions of the mistake and failure system is this check-up *of* the management *by* the management.

Another important accomplishment is the elimination of the famous old army game called "passing the buck." In our factory this game has become practically extinct and no one regrets its passing.

After three years' experience, during which this system has disclosed a number of bad conditions that might not otherwise have been exposed, thus allowing an opportunity of innovating and improving methods, our factory superintendent pays this high compliment in a note to the whole executive organization:

"The system has been an appreciable factor in our success in reducing radio tube losses; in improving scheduling; in improving labor efficiency; in improving materials efficiency and all other items included in manufacturing costs."

The human angle has worked out splendidly. Our supervisors do not feel in any way that it is the aim of the system to persecute them for their errors. As a proof of this, the foremen now issue reports on errors *in their own departments*, for which they have to sign, but which have a very good effect on the operators or supervisors in the department, who are charged directly with the mistake or failure.

MISTAKE OR FAILURE REPORT

To: Factory Supt:

The following failure may be charged against me.
The following mistake may be charged against me. ✓
I accept the responsibility for correcting the following faulty condition.

1. Item — Error in schedule on Type 215. No provision made for running sample lot before starting production.
2. Effect - (specify loss in time or money wherever possible) — 1 Hour Lost Time for 10 operators. Impossible to meet schedule. Possible failure to ship orders.
3. Cause — Misunderstanding of proper system for scheduling new type.
4. Person directly responsible — (Signed by Production Schedule Clerk)
5. The following steps have been / will be taken to prevent repetition: — Standard practice written and issued covering procedure for scheduling new types.

Signed - (Foreman)
Dept. - Production Control

Originated by - (Foreman)
Department - Units
Date - 11-19-36

Figure 1. This mistake cost 10 hours of productive time

SUMMARY OF FAILURE REPORTS
FOR THE WEEK ENDING OCTOBER 30

Department	Total Reports Week Ending October 23	Total Reports Week Ending October 30	Total Lost Hours Week Ending October 23	Total Lost Hours Week Ending October 30
Bulb Preparation	2	1	0.1	0
Stem	3	1	4.2	0
Grid	255	90	191.8	65.2
Filament & Cathode	11	7	0	0
Miscellaneous Parts	1	1	0	0.5
Units	5	6	0	0
Mount	18	23	0	0
Production Control	1	2	2.0	6.5
Undetermined	0	1	0	11.0
Intradepartmental	20	15	66.9	48.1
	337	391	307.0	203.5

Value of Lost-Time Hours for the Week Ending October 23 - 44¢ - $135.08
Value of Lost-Time Hours for the Week Ending October 30 - 44¢ - $ 89.54

Figure 2. Every week the failure reports are summarized

Job Shop Inspection on Bonus

WILLIAM R. MULLEE
Standards Department
American Hard Rubber Company
Butler, N. J.

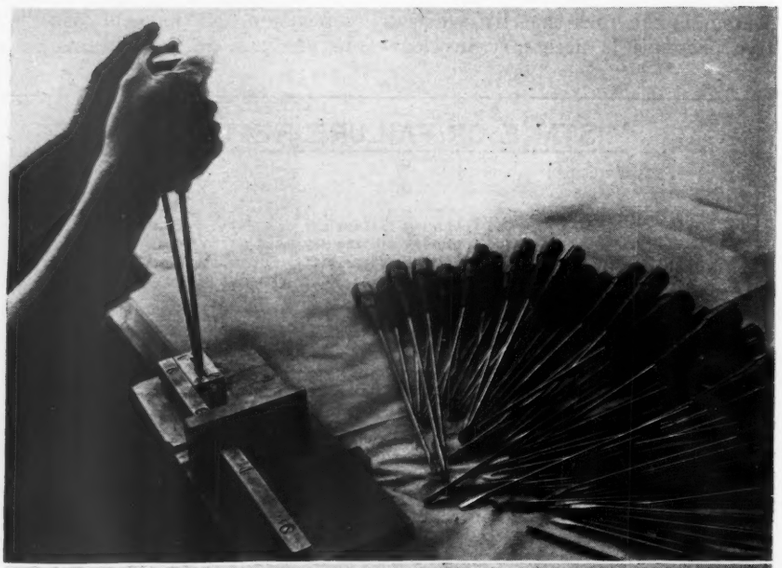
WAGE incentives for the inspection department should be considered under two headings, *mass production* and *job shop.*

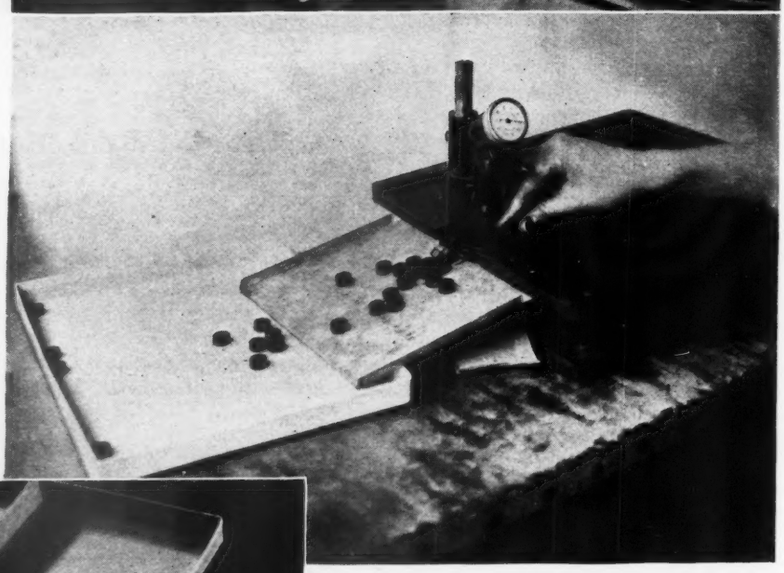
With mass production inspection one must first set up definite quality standards, then develop and teach the "one best method," and finally establish a routine for a check or percentage reinspection.

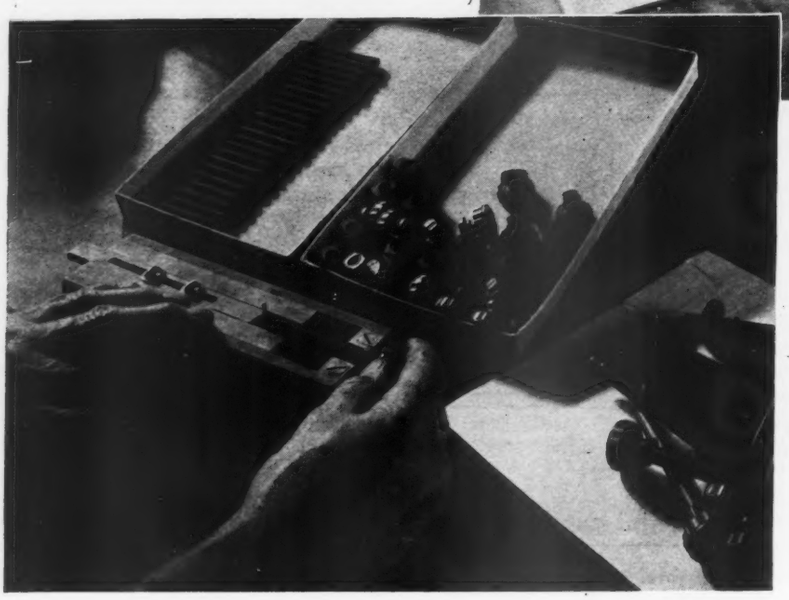
It is almost impossible adequately to describe "quality" in words. The sample board method is therefore the best guarantee of permanent quality standardization. Samples of the product, carefully selected to illustrate good, scrap, and various repairable conditions, are properly labelled and mounted on boards. These boards are invaluable to back up the experienced inspector's decision, and also to train beginners.

After quality and methods are standardized, any good wage payment plan for mass production inspection can be used. About half of the work at our Butler plant is of this type.

The other half of the work is of the job shop type covering over 30,000 different articles. Under the







American Hard Rubber inspectors have become decidedly motion-minded. Many have attended motion-study classes and made worth-while suggestions. That is one way to improve their rating

Top, two-at-a-time test and visual inspection of screwdriver assembly. Blade length checked and tested for twist. Get-ready and aside eliminated. Total saving, 33 per cent

Directly above, table for gaging. Slide principle eliminates pick-up, carry, and aside. Saves 20 per cent

Left, gage and assemble in one operation. Eliminates a get-ready and aside. And saves 45 per cent

standard cost system, the chief inspector's department was allowed a fixed percentage of the productive labor by burden center. But some jobs cost double the allowance and others half, and he hated to see red ink on some and black on others. He felt that every job should pay its own way. In addition, the more ambitious inspectors wanted measurement so that they could prove they were worth more money.

A good wage payment plan is one under which the pay is in proportion to the employees' *total* contribution. Job shop inspection throws a great burden on the individual's judgment. Here the employee is contributing physically in terms of quantity and mentally in terms of a very intangible thing called judgment. It is no fairer to pay a job shop inspector by quantity only than to pay executives and clerks by quantity only.

Defining the Intangibles

Some of the items that make measurement of intangibles so important in job shop inspection are:

1. Vagueness of many customers' quality requirements, tolerances, finish, and the like.
2. Impracticability of preparing 30,000 quality sample boards.
3. Knowledge of many different manufacturing processes required by inspector to determine whether material is repairable or scrap.
4. Necessity for inspector to decide which department or operator is at fault.
5. Difficulty in detecting careless inspection by partial reinspection (100 per cent too costly).
6. The fact that some can do all kinds of gaging, testing, and the like, while others can do only one kind.
7. Ability of some to set gages and follow method on instruction cards. Others require much supervision and instruction.

We concluded that a wage plan for the job shop inspectors must be one-half production measurement and one-half judgment measurement. Production measurement was obtained by establishing time standards for each article. For accuracy and economy of application, time standards were built up synthetically from tables of standard data because time studies on 30,000 articles would have been very costly. The total production is expressed in units (man-minutes of work). The number of units per 100 minutes, or unit rating, is shown on the daily posting sheet for each inspector.

All of this was routine. But judgment measurement was a challenge. We certainly wanted a numerical method to avoid personal prejudice. After examining several salary classification rating methods we concluded that there were two factors to consider in measuring the value of the individual's judgment—*type of work* and *type of worker*.

The type of work ranged from that done by beginners to work trusted only to the most experienced. Six grades were established:

1. *Pipe Bits*—Large volume; simple inspection; beginners' start.
2. *Syringe Pipes* — Simple molded pieces; next job after bits.
3. *Separators* — Very exacting requirements; product fragile, costly; gaging and special tests required; work demands specialist.
4. *Miscellaneous Products* — Mostly visual, but some simple gaging; all-around experience required.
5. *Rods and Tubes*—A special class; customer history involved; knowledge of manufacturing process required; operation peculiar to American Hard Rubber Company.
6. *Extreme Precision Work*—Gaging with Johannson, plug, or thread gage, micrometer, dial gage, and the like; operator must have "feel" of close tolerance work plus experience of Class 4.

The type of worker was expressed in five degrees of importance:

1. *Attitude* — Interest, suggestions, cooperation, and the like.
2. *Supervision* — Amount required; ability to supervise.
3. *Experience*—Years and kind.
4. *Versatility*—Change from kind to kind; ability to learn.
5. *Quality*—Customer returns, complaints, inspector's integrity involved.

Numerical values were assigned to these items as shown in Tables I and II. Each inspector's job is analyzed, and her points in both tables are totaled to get her rating. For the purpose of simplicity, ratings were grouped as shown in Table III.

Operation of the payment plan is similar to measured day work. At the beginning of each 3-month period, every inspector is carefully rated, and a list is published of inspection classes A, B, C, and so forth. Each inspector is told that during this period her production will be measured and unit ratings posted daily. At the end of the period daily unit ratings are averaged. This average determines her new premium rate for the next three months' period. (Table III.) That is, during one period she determines her hourly rate for the next period.

The same rate is paid for measured as for unmeasured work. It is up to the Standards Department to measure.

No extra premium is paid for exceeding 120 unit rating. We feel that by exceeding this speed the element of "examine" may be sacrificed.

An important part of the plan is the job standardization and motion study work connected with it. A mimeographed instruction card is filled out for each article. This defines the task and tells the inspector what to do. The job analysis necessary to build this individual standard from data often reveals method changes which cut inspection costs.

TABLE I

Type of Work (By Majority)	Points
Pipe Bits	5
Syringe Pipes	10
Separators	15
Miscellaneous Products	20
Rods and Tubes	25
Extreme Precision Work	30

TABLE II

Type of Wk.	Points Poor	Fair	Good	Perf.
Attitude	1	2	3	4
Supervision	1	2	3	4
Experience	1	3	5	7
Versatility	1	2	3	4
Quality Wk.	2	5	8	11

TABLE III

Premium Rates per 100 Minutes

Letter Points	Inspection Class F To 23	E 24–31	D 32–39	C 40–47	B 48–55	A 56 Up
To 95	$0.00	$0.02	$0.04	$0.06	$0.08	$0.10
96 – 101	0.02	0.04	0.06	0.08	0.10	0.12
102 – 107	0.04	0.06	0.08	0.10	0.12	0.14
108 – 113	0.06	0.08	0.10	0.12	0.14	0.16
114 – 119	0.08	0.10	0.12	0.14	0.16	0.18
120 Up	0.10	0.12	0.14	0.16	0.18	0.20

Women Are More Conscientious

DONALD A. LAIRD
Rivercrest Laboratory
Hamilton, N. Y.

WOMEN are more conscientiously devoted to their work than men are—if they like their boss and their fellow-workers. But they pilfer from one another and from the company just as much as men workers do. They deceive just as much in telling their previous experience to the employment interviewer. In the common deceit of lying we cannot say which sex takes the prize, for their lying is of entirely a different sort.

Gossip, snobbishness, extravagance, and selfishness are judged more common among women. The first three are forms of lying.

The common feminine tendency toward deceit is not downright and blatant falsifying but verbal pirouetting. It is one source of her tact—she lies about others as she would have them lie about her. Little wonder this light that lies in woman's eyes led Alexander Pope in resignation to say "Woman's at best a contradiction still."

Of course it makes her a good receptionist for the office, and especially capable at keeping unwelcome visitors away from some too-busy executive—just as it makes her successful in concealing marriage when company rules would cause dismissal.

In things she judges important she is especially trustworthy and honest, but it comes easy to lie a little if she thinks it will irritate a girl she does not like. "I saw Frank at the movies with a blonde," she will tell Agnes; a pure falsehood, but it makes Agnes unhappy, which was the goal sought.

It makes her a good receptionist

"I saw Frank with a blonde . . ."

Her supervisor must be able to see through these unfermented falsehoods, these evasions which mislead by inference, which may conceal real sources of friction or low morale. She must be interviewed by conversation, not by direct questioning if we are to get at the truth.

Born That Way

Women are educated in duplicity. They may not be born that way, but they quickly arrive there through finding out what works and what does not work. Said Rousseau: "Her dress is extremely modest in appearance, and very coquettish in fact; she does not make a display of her charms, she conceals them; but in concealing them, she knows how to affect your imagination. Everyone who sees her will say, 'There is a modest and discreet girl.' But while you are near her, your eyes and affections wander all over her person, so that you cannot withdraw them; and you would conclude that every part of her dress, simple as it seems, was only put in its proper order to be taken completely to pieces by the imagination."

Whether or not it is true that it takes a thief to catch a thief, it seems fairly obvious that the best person to interview a woman, as in the employment office, is another woman—or the type of man who has a mind that by resonance can penetrate her little shams and deceits.

(This is the fourth of five articles by Dr. Laird on "Things Worth Knowing If You Employ Women." The fifth will appear in June.—ED.)

You want to know

and the editors will gladly tell you more about the things mentioned on this page

• FABRICS can be flame-proofed by dipping in a solution of a new chemical. No fireproofing claims are made by the manufacturer, but materials will not ignite from a sudden burst of flame. It is said color and feel of fabrics is not changed. (5701)

• AUXILIARY light projectors may be attached inside skirt of dome-type reflectors to direct additional light to shaded machine surfaces or workbenches. (5702)

• NEW SET of Johansson precision gage blocks is offered at lower price than earlier No. 2 set. There are 35 blocks providing 80,000 different size measurements in steps of 0.0001 in. (5703)

• ANCHORING bolts and screws in solid materials is a job that must be done right. To that end there is a booklet showing various types of anchors, their holding power, the correct way to install them. (5704)

• BECAUSE its construction affords a more concentrated, more intense light beam, a prefocused flashlight lamp is supposed to give more light and throw the beam farther than focusing-type flashlights. (5705)

• PHOTOELECTRIC CONTROL operates a cloth-straightening device which removes skew from cotton cloth during the tentering process. Its use makes possible straighter cloth at high speeds, reduces operator fatigue. (5706)

• LOW POWER FACTOR is distinctive characteristic of a new phenolic molding compound which finds special application in high frequency electrical equipment. It has good molding qualities too. (5707)

• SOMETHING you've looked for is a rubberizing compound to be applied without a primer. There's one which makes a good bond in one application. It takes no skill to apply it by dipping, spraying, or hand brushing. (5708)

• IF you would like to learn something about lubrication from a non-technical approach, a series of booklets prepared by one of the large oil companies will prove interesting. (5709)

• FLOORING MATERIAL, acid-resistant, is intended for use under severe wet conditions in food plants, breweries, tanneries, and the like. Abrasion resisting and quick setting, it can be applied over either old or new concrete floors. (5710)

• ADJUSTABLE SQUARE is mighty handy for toolmakers. Its 4-in. tempered blade can be adjusted to any point within its length and held firmly in accurate alignment. (5711)

• FOURTH in a series of pamphlets on relation of technology to the American standard of living discusses relation of machinery to consumer purchasing as reflected in factory workers' wages and prices of manufactured goods. (5712)

• DRY CELLS of 1 kw.-hr. capacity have made their appearance. Intended for use on steady loads within current ratings of 0.250 and 0.500 amp., they are available in 1.4- and 2.8-volt ratings, are housed in black molded boxes. (5713)

• STENCIL BRUSH works on fountain pen principle. Its handle holds enough ink to stencil steadily for hours and you have only to twist the wrist a bit to regulate the flow. It will work on any stencil job you have. (5714)

• WORK GLOVES impregnated with synthetic rubber resist grease, oil, and many acids. (5715)

• IF you want to see what employee associations can really do under sponsorship of an enlightened management, time will be well spent perusing a pictorial booklet prepared by one such association to show what it is doing in the line of welfare and recreational activities. (5716)

• ONE of those practical novelties is a 4-key key ring with pressbuttons releasing the keys. Press button No. 3 and No. 3 key pops out like a pocketknife blade. (5717)

• FOLDING TRUCKS occupy little space when folded and put away as a reserve for extra busy times. Construction is light so heavy materials can't be handled, but there are plenty of things they can tote around. (5718)

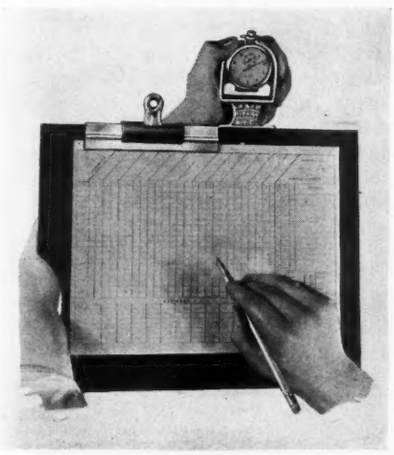
• WRAPPING MATERIAL of the cellulose type, which means it's transparent, is fire-resistant and very strong. What's more, it can stretch under a hard pull, return to shape when tension is removed. (5719)

• BURGLAR ALARM consists of network of invisible infra-red rays emanating from a light source and reflected back and forth by series of mirrors to a phototube. Latter is connected to amplifier which sets alarm bell or siren going, or sends message over telephone line to police headquarters. (5720)

• IDEAL for electric meter work is a combination socket wrench and screwdriver. Not only is its small size advantageous, but it has an insulated handle for safety's sake. (5721)

• WHAT lamp size and spacing to use in lighting layouts? Circular slide rule supplies the answer, given footcandle intensity desired and space to be lighted. (5722)

FOR photographs and record forms that must be placed in ring binders without damage to edges, here's a handy hinge. Photograph or form is attached between two gummed edges and holes are punched in cloth-reinforced paper strip. (5723)



TIME-STUDY BOARD to take horizontal forms has been sought for some time by time-study men. Here it is—made of strong thin plastic, with clip, and watch holder mounted directly in line of vision. Arm cutout at left makes positioning and holding easy. (5724)

Instrument Doctors

How good is your instrument man? Do you know that some of the instrument manufacturers have set up training programs, not only for their own personnel, but also for the users of their equipment?

J. F. ANDREWS
Assistant Editor

WITHIN recent years the advantages offered by the use of instruments that have been intelligently selected and applied have become increasingly evident. In particular, the possibility of increasing both production and quality of output through the aid of automatic control devices has led to much industrial research and development work in which trained instrument men have been of the greatest assistance. On the other hand, as industry becomes more "instrument-minded" the development of suitably trained men to install, service, or repair such devices presents an important problem to both the manufacturer and the user.

The necessity of employing well-trained men to supervise the care and application of instruments needs little discussion. A man who has had the training needed for the servicing of pyrometers, flowmeters, thermometers, and so on, and at the same time has been educated to understand and visualize manufacturing problems will be a valuable employee for any industrial plant. This is a position of such importance that it justifies the selection of a man of the highest type, paid a salary commensurate with the responsibilities.

It is well recognized that not everyone can be an expert accountant, engineer, or artist, and the same thing is true of handling instruments. Not just anybody can be trained to service industrial instruments properly. A thoroughly competent electrician or mechanic may be poorly adapted, temperamentally and physically, to work on instruments.

The man selected for such work should preferably have a technical foundation in mechanical, electrical, or chemical engineering or physics, with a strong leaning for the practical side of things and an ability to work with his hands. Men who have had a hobby or unusual interests along electro-mechanical lines seem to be particularly adaptable to the instrument field.

How and Where

After selecting a suitable man, many plants are confronted with the problem of how and where to have him trained. Leading instrument manufacturers have recognized the importance of properly educating men in the application and adjustment of their meters, and have established educational and training facilities for their own personnel, as well as for the users of their equipment. The scope of the training given by a manufacturer is usually limited to his own line of equipment. However, the basic principles underlying the operation and application of instruments are sufficiently uniform to enable a student to apply them to any make.

The training courses given by the Brown Instrument Company division of the Minneapolis-Honeywell Regulator Company are in general typical of those conducted by other manufacturers.

The experience of this company shows that, in view of the limited time available for training purposes, it is important to formulate in advance some well-defined idea of the types of instruments to be studied, and whether the instruction is to fit the student for actual servicing of instruments, or for general supervisory work only.

An average, intelligent man with the kind of background mentioned previously has been found capable of mastering the details of repairing and servicing an average of one type of meter a week.

Some types of meters require the attainment of skill in the handling of tools and parts, in addition to knowledge of the general construction of the meter. Training for service work on such types of meters usually requires about two weeks' time. Supervisors are as a rule interested only in a working knowledge of the instruments and can therefore cover the subject in a comparatively short time.

General Courses

The table shows the general courses given and the length of time required for each. When a student enters the training course he is turned over to the instruction supervisor, who has had many years of experience in instrument development and research work. Complete instruction facilities are brought to the student in one department.

In these courses the students are given a comprehensive training in the dismantling, assembling, and repairing of the different types of meters listed, in the indicating, re-

cording, and controlling types, both electrically and air actuated. Work on flowmeters includes a thorough study of the electrical, mechanical, and area types of meters. After this part of the work has been completed, the students are given a careful grounding in the theory of flow measurements, including orifice calculations, under the direction of the engineering department. A study of the proper application of flowmeters is an important phase of the course.

Written Examinations

In addition to the practical bench-work in which each student is individually instructed, every course is terminated with a written examination.

It is evident, of course, that any course of instruction on instruments can provide only the groundwork for future development. Very little practice in application can be crowded into a few weeks of training, in addition to study of the details of meter construction. A student will, therefore, have plenty to learn about instruments and instrumentation after he gets back home, but he will, with the fundamental training he has received, be able to progress much faster than he would without it.

It has also been found to be almost as important to provide for the student engineer's welfare and contentment during the training period as it is to provide for his instruction. The time allotted to the work usually ranges from two to ten weeks, depending on the number of types of instruments to be covered and the kind of instruction desired—that is, supervisory, maintenance, and so on. The student has little time for study during working hours; most of his study and paper work must be done at night. Clean, comfortable living quarters, preferably close to the plant, are essential and usually are available at nominal expense upon advance request to the manufacturer in whose plant the instruction course is given.

Subject of Course and Time Required

Millivoltmeter pyrometers,	2 weeks
Potentiometer pyrometers,	2 weeks
Flowmeters, elec. and mech., including flow calculations,	2 weeks
CO_2 meters, electrical,	4 days
Tachometers, electrical,	3 days
Thermometers, resistance type,	3 days
Pressure gages, bellows, helix, bourdon tube,	2 days
Thermometers, pressure type,	4 days
Hygrometers and psychrometers,	2 days
Automatic controls, electrical,	1 week
Automatic controls, air actuated,	1 week

High See Level

Illumination at new De Soto plant does full justice to modern production equipment. By day, full use of natural light. By night, high intensities, even distribution, no shadows

E. L. BAILEY
Electrical Engineer
Chrysler Corporation, Detroit

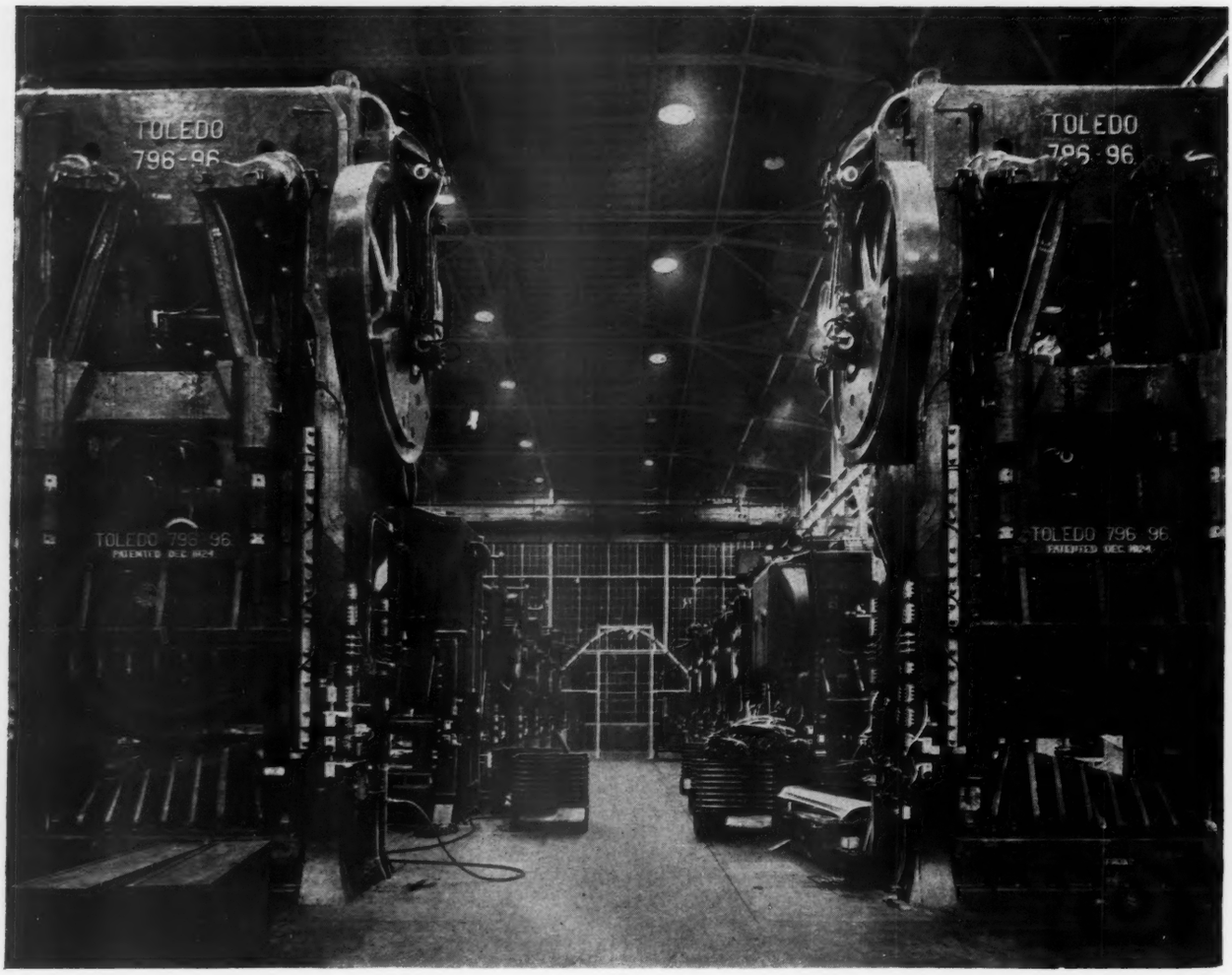
WHEN the new press division for the Chrysler Corporation was set up last summer at the De Soto plant in Detroit, the lighting system was planned to do full justice to the mechanical equipment. It was realized that up-to-date machinery could not be operated at maximum capacity unless the operators were given proper and adequate light. The function of light in reducing hazards to a minimum was also kept in mind.

Both of these factors are especially important in press work, where visual acuity must be of a high order and where glare by reflection from metal surfaces is likely to cause accidents.

Pictures accompanying this description illustrate the building details important in providing adequate natural light. Approximately 70 per cent of the entire outside wall of the building is of glass. In addition, each bay in the small press and finishing part of the plant is 38 ft. wide and provided with skylights on each side of the roof monitor. The large press bay, 72 ft. wide, has the same provision, with the width of the skylights doubled to provide for the wide space to be covered.

Any statement of foot-candles of natural light available naturally depends upon the character of the day, whether cloudy or sunny, and the particular time of day when observations were taken. It may be

The large press bay is 72-ft wide. Illumination at night is 22 foot-candles. Even on dull days, the plant's large window areas provide 25 foot-candles of natural light in the midst of the presses, 39 foot-candles in many places



interesting to note, however, that in the late afternoon of a rather dull day, foot-candle meter readings registered a very high daylight factor. In the midst of four very large presses, 25 foot-candles were available, while along the metal-finishing conveyors, which run at right angles to the direction of the bays, the reading was 39. No readings at the operator's position in front of the press registered below 10 foot-candles.

High See Level at Night

Artificial light is provided by high-intensity mercury-vapor lamps of 400-watt capacity. The system was designed to give 28 foot-candles in the low bays and 22 foot-candles in the press bay, without the equipment in place. The dark gray paint on the presses and the black wood-block floor have, of course, a high absorption factor. Despite this, the usable artificial light is more than that provided in many offices.

In the big press bay where the hanging height is 37 ft., 4 in. above the floor, polished aluminum reflectors are used to direct the light downward. In the remainder of the plant, where the hanging heights are 18 ft. and 30 ft., R.L.M. dome reflectors are used. Spacing of the outlets provides even distribution.

In the high bay of the large press section, outlets are arranged on 19-ft. centers, and in the rest of the plant on 17-ft. centers. Outlets are staggered from row to row. An outlet in row one, for example, comes opposite a blank space in row two, and so on, giving even diffusion.

It must be emphasized that this is a general lighting system. Only at the power hammers is local lighting used, and this is merely to throw light rays parallel to the surface of the metal being worked upon in order to bring out defects.

Standing in any position in this shop, one is impressed with the absence of shadows, the softness and distribution of the light, and the sharpness of detail observed at great distances. No light sources are within the operator's range of vision. Glare, which might be expected from the metal handled does not exist.

Each bay in the small press and finishing part of the plant is 38 ft. wide. Overhead lights give 28 foot-candles

Approximately 70 per cent of the outside walls are glass, making for a striking display at night, and for maximum natural light during the day

A Contactor for Every Need But You Must Pick the Right One

F. C. IGHLEHART
Control Engineering Department
Westinghouse Electric & Manufacturing Company
East Pittsburgh, Pa.

WHEN SELECTING a contactor, the first consideration is the required rating. It is determined by the amount of current the contactor must carry continuously, and the duty cycle, or the frequency and severity of circuit interruptions. The type of contactor and method of installation are further determined by unusual service conditions such as extreme temperature, excessive humidity, presence of corrosive fumes, dust or dirt, or subjection to vibration or shock.

Rating of a contactor designates its operating limit, and is expressed as a figure based on the power governed and the duty and service required. Therefore ratings are defined as eight-hour rating, periodic, short-time current, and short-circuit-interrupting rating.

The eight-hour rating is recognized as standard by N.E.M.A. It is defined as the ampere-carrying capacity of the contactor for eight hours under conditions of free ventilation, without exceeding fixed temperature limits.

Periodic rating defines the load that can be carried for specified alternate periods of load and rest for a certain total time, starting cold.

The short-time current rating specifies the maximum root-mean-square alternating or direct current which can be carried for a definite period of time, usually one second, without exceeding the thermal limitations of the contactor. Short-circuit-interrupting rating is the highest current at rated voltage that the contactor can interrupt under the duty specified, usually closing followed immediately by opening without a purposeful delay, with a repetition of test after two minutes.

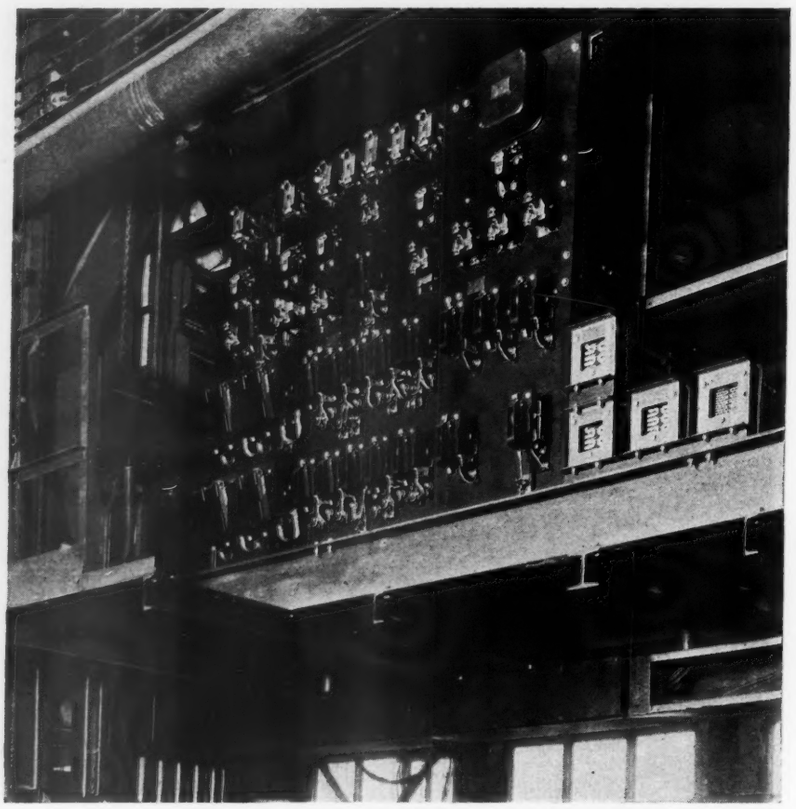
Eight-hour ratings adopted by N.E.M.A. as standard for a.c. magnetic contactors operated in the open are 15, 25, 50, 100, 150, 300 and 600 amp. Standard ratings of d.c. magnetic contactors operated in the open are 25, 50, 100, 150, 300, and 600 amp. Ampere ratings of a.c. contactors operated in inclosures, such as standard inclosed across-the-line starters for induction motors, are 90 per cent of the open ratings.

Intermittent ratings of contactors on crane and hoist or steel mill auxiliary duty are 133⅓ per cent of their eight-hour open ratings.

For convenience in application, across-the-line a.c. magnetic starters are given the horsepower rating of the largest motor with which they are designed to be used. Standard horsepower ratings for single and three-phase inclosed starters are given in the table. The ampere and horsepower ratings given for three-phase starters apply also to two-phase, three-wire starters, the current ratings of the latter being fixed at 90 per cent of their eight-hour open ratings, based on the average of the currents in the three legs of the two-phase circuit.

Direct-current motor controllers are given the same horsepower rat-

A d.c. controller for a copper wire drawing machine. In the bottom row there are, from left to right: two 600-amp. contactors, five 150-amp. contactors with electrical interlocks, one 100-amp., and one spring-closed 100 amp. contactor with electrical interlock. Auxiliary devices above are time-delay, overload and current relays



ings as the motors to which they are applied. Use of across-the-line d.c. starters is practicable only in comparatively small horsepower ratings, because of the inherent starting characteristics of d.c. motors.

The question of the type of contactor to be chosen is interrelated with such considerations as function, rating, service conditions, and personal preferences.

Contactors are classed as normally open or normally closed. The great majority in use are of the former class, being employed in across-the-line starters and similar devices. Certain control schemes, however, require contactors of the normally closed type.

Next comes the question: Will the contactor have to interrupt as well as close the circuit and carry the current? In most instances the answer is yes; hence a contactor having a suitable arc quenching device is necessary. In certain applications, however, contactors are employed to close circuits and carry heavy currents without having to interrupt them. Then the answer is no, and it is possible to select a contactor designed for this type of service at a considerable saving in cost, size, and weight.

For Unusual Service

Mechanical design of a contactor is of importance when conditions of service are unusual.

It is important that the switch be of sturdy construction and that the contacts produce positive making and breaking. A contactor should be equipped with an effective arc-quenching device that confines and extinguishes the arc promptly. To keep maintenance cost low, all terminals should be accessible and replacements of coil and contacts be readily effected.

Whenever contactors are to be operated under unusual conditions, the manufacturer's representative should be consulted. For example, when the temperature of the surrounding air or other cooling medium exceeds 40 deg. C. (104 deg. F.), or if the altitude is greater than 3,300 ft., special construction may be needed.

Excessive moisture tends to make dust adhere to surfaces, impairing the insulating properties of parts and interfering with the radiation of heat. It may necessitate protection of metallic parts by plating or otherwise. Selection of insulating materials less readily affected by moisture may be possible. Inclosing the control apparatus in a watertight cabinet will usually afford adequate protection to metal and insulation.

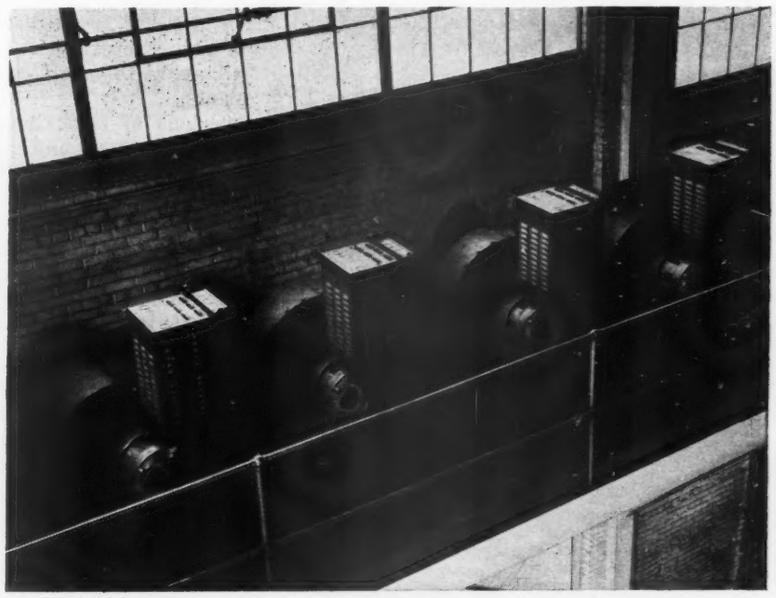
Exposure to dust or steam or oil vapor may be avoided by a suitable inclosing cabinet. Salt air or harmful fumes may necessitate special treatment of the exposed surfaces of the contactor, or immersion in oil.

Contactors are commonly designed for operation in a stable, vertical position only. There are special designs for applications involving movement, shock, or extreme vibration.

A contactor is considered to be a relay in the sense that it establishes and interrupts an electric circuit in response to an electrical stimulus originating in the same or another circuit. With a contactor, therefore, there are associated auxiliary devices which control its operation, as they in turn are acted upon by such influences as an operator's hand, a rise of temperature, or movement of a machine. Common auxiliary devices are pushbutton stations or drum controllers for manual control; automatic switches controlled by pressure, temperature, or other influences; limit switches; electrical interlocks; auxiliary contacts having low current-carrying capacity for controlling one contactor by the opening and closing of another; mechanical interlocks; time delay mechanisms applied directly to the contactor; auxiliary relays, such as time delay, overload, current, and so on, which serve to operate the contactor under predetermined conditions.

Contactors usually are inclosed in cabinets with the auxiliary devices, making a complete self-contained unit. The most widely used com-

(*Continued on page* 86)



Magnetic switches in ventilated cabinets control 10-hp., two-phase, 220-volt motors driving exhaust fans in a steel fabricating plant

Horsepower Ratings of Inclosed Across-the-Line A.C. Magnetic Starting Switches

On eight-hour basis

Eight-Hour Rating Amperes		*Maximum Horsepower*					
		110 Volts		220 Volts		440-550 Volts	
Open	Inclosed	Three Phase	Single Phase	Three Phase	Single Phase	Three Phase	Single Phase
15*	13½	1½	1	2	1½	2	1½
25	22½	3	1½	5	3	7½	5
50	45	7½	3	15	7½	25	10
100	90	15	7½	30	15	50	25
150	135	25	—	50	—	100	—
300	270	—	—	100	—	200	—
600	540	—	—	200	—	400	—

* Obtainable only in reversing starters.

When Wiring Your Plant

Installing a distribution system means more than stringing up some wires; needs must be studied and ways of meeting them worked out

F. L. AIME
Electrical Engineer
Anaconda Wire & Cable Company,
New York

IMPORTANCE of electric power supply in industrial production is far greater than would appear from the part that power plays in the cost of the finished product. With few exceptions it is usually reported that power represents from ¼ to 4 per cent of the cost of the product. Of course, 4 per cent of the cost is not to be disregarded, but whatever its proportion, the importance of power does not receive the attention it deserves.

The distribution system is the means by which electrical energy is transmitted throughout the plant. This and succeeding articles will discuss some of the important features of industrial distribution systems that must be considered when planning extensions or laying out systems for new plants. Since these features are common to all industrial distribution systems, regardless of the type of manufacturing, the discussion will apply to small as well as large plants.

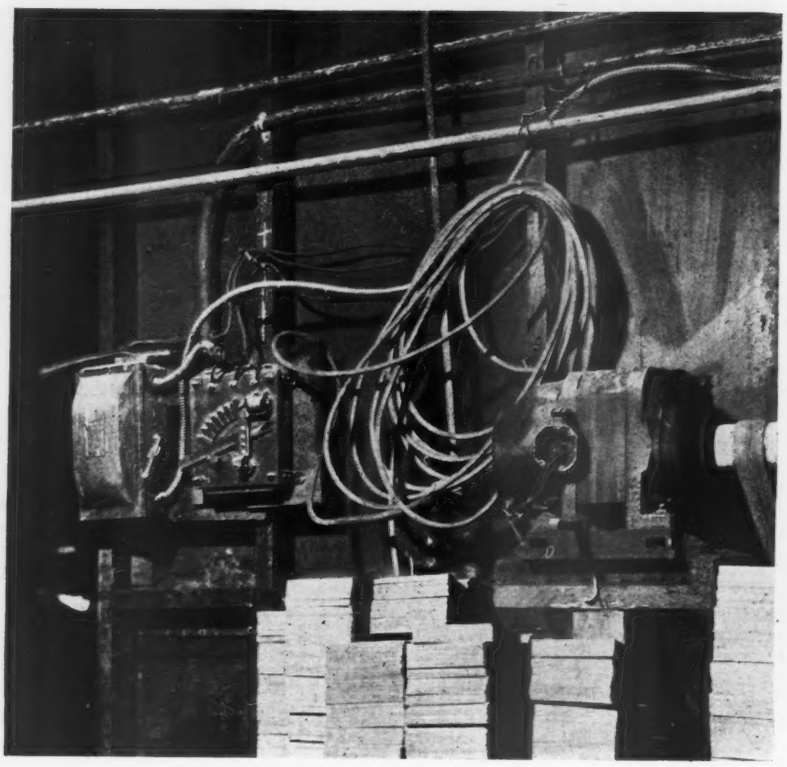
During periods of slack business the distribution system and power supply are not a pressing problem; as business picks up production becomes all-important and economical distribution and usage of power assume a new significance. In many instances plants must be extended or a new plant built, bringing up electrical problems that must be recognized and solved.

In many plants, even modern ones, one gets the impression that the power supply system has been planned inadequately, or not at all. Mazes of wires and cables may be seen running over roofs, or suspended from ceilings, trusses, or walls, and going in all directions. It is not uncommon to see men stepping over cables on the floors, or fuse boxes with doors open and circuits exposed. It is indeed fortunate that breakdowns in service do not occur more frequently.

Statistical averages cannot, however, be taken as a basis for planning an industrial distribution layout, any more than they can be applied to automobile accidents and used as an argument for crossing against red lights. The question is not how frequently an interruption occurs, but what it means to production. One serious interruption can be sufficient to justify the entire revamping of a distribution system.

The term "power off" appears on production reports as a cause of delays. Sometimes this excuse is given as the best explanation of an unavoidable interruption, although the distribution system in a plant can be so planned as to make power interruptions occur seldom, if at all. It is merely a question of how important an interruption is, and how much money the management is justified in spending to prevent trouble.

One way to keep the maintenance crew busy



It May Cost Less

A well-planned distribution system is not necessarily more expensive than a crazy-quilt of conduits, cables, and wires haphazardly thrown together. In many instances a well-designed system costs less than a poorly designed one. Even if a good system costs somewhat more, the additional fixed charges per unit of product are small. Of the ¼ to 4 per cent that power represents in the cost of the finished product, the greater portion is energy cost; only a small part is fixed charges on equipment. Assuming the total to be 3 per cent, the fixed-charge portion would not exceed, say, 15 per cent, or 0.2 per cent of the cost of the product. If a good installation costs 20 per cent more than a poor

one, the apparent increase in the cost of the product would not exceed 0.04 per cent. This increase, however, is only apparent and usually would mean a real decrease because of the freedom from interruptions, lower maintenance costs, and higher all-around efficiency.

Find Out What Is Important

In planning an adequate distribution system for an industrial plant it is important to recognize that certain features or requirements will be of more consequence in some plants than in others. Careful analysis and competent engineering are required to determine the problems and needs of a plant and how they can best be solved. Manufacturers of electrical equipment render a considerable amount of engineering service to their customers, and are able to do so competently. Their services are, however, limited to the products they sell. In that respect they are qualified to furnish a great deal of information on what a certain product can do under given circumstances, or to develop a new product to meet new requirements.

Nevertheless, an electrical distribution system must contain equipment from many different manufacturers, and to coordinate it properly and make it all function to the best advantage requires skillful engineering. If the necessary knowledge and experience are not available in the plant's own personnel it is advisable to obtain the services of an outside consultant.

It is assumed that the question of whether the present or the new plant will generate its own energy or purchase it has been settled. Economy should not be permitted to be the only determining factor. Reliability may be of equal or greater importance. A well-designed isolated plant may be more reliable than a single source of supply from a central station system; on the other hand, two isolated plants may be less dependable than a single source of supply from the network of a well-interconnected utility.

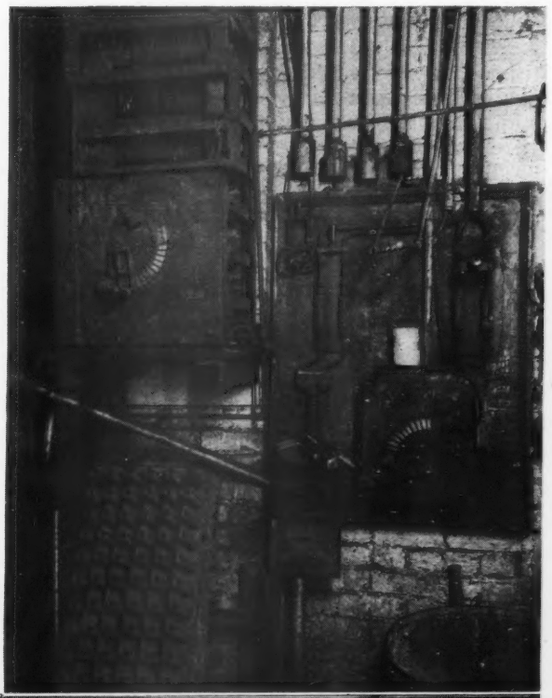
The matter of reliability of the main sources of supply, however, cannot be studied as an independent subject. It must necessarily be related to the manufacturing processes. Obviously, it would be wasteful to spend a large amount of money to secure an absolutely dependable power system when the processes are such that they are subject to frequent interruptions from other sources, or can be interrupted occasionally without causing trouble. Conversely, where continuity of operation is of prime importance reliability of the power supply is paramount.

The quality of maintenance available is of importance because of its direct bearing on the layout of the distribution system. If a minimum of maintenance is required, more attention must necessarily be paid to details of design and the use of good materials and installation methods.

Keep Safety in Mind

Personal contact with maintenance men in various industries indicates that they frequently regard recurring troubles as unavoidable, and take them as a matter of course. It is difficult to train some maintenance men to report all the troubles they experience. Many feel that the troubles may be blamed on them, instead of upon the inadequate equipment which is really at fault.

Safety is of the utmost impor-



The penalty for poor workmanship is not always exacted immediately, but there is no telling when it will be. For example, the defective cable splices shown here stood up for a time, but eventually broke down completely. The installation at the right with open-knife switches and open wiring on a wooden panel is certainly no better than it should be. How many violations of good practice can you find in the photograph of the big motor installation?

tance, but popular conception exaggerates the damage from electrical causes. That there is so little of it is probably due to the National Electrical Code, which must be complied with, and other safety codes that are usually observed. In many instances it will be necessary to go beyond the prescribed safety limits; in others the prescribed rules will be more than adequate. With proper planning a remarkable degree of safety can be achieved at a reasonably low cost. Although some installations must be foolproof, it is as a rule unnecessary to assume that the attendant is a fool.

Energy Losses and Power Factor

Energy losses and voltage drop are closely related. Both can be reduced to the minimum by providing sufficiently heavy conductors. Although voltage drop primarily affects operation, energy loss is principally a matter of economy. The more copper, the lower the energy loss. Thus, it is a matter of checking energy cost against the fixed charges on the additional copper in the form of wire and cable.

The question of choice between individual motor drives and lineshaft drives involves a number of factors. Among these, the cost of power and wiring must be considered. The most suitable types of motors must be decided for each application. Selection of motors has a direct bearing on the design of the feeder system, because such matters as power factor of the load, necessity of variable or constant-speed operation, starting torques required, and other items must be considered.

If it is expected that a larger motor or motors will be needed in the future, a choice must be made between the installation of larger feeders in the beginning, and the cost of replacing feeders and motors later on.

Power factor is an ever-present problem in industrial plants, particularly those containing many motors. It has a direct bearing on the cost of energy, size of feeder conductors, transformer capacity, and other items. Even if an industrial plant is not directly penalized for poor power factor, other features make a high power factor desirable.

Selection of the circuit voltage is more than a matter of economy, even though this factor plays an important role. Such items as simplicity of layout, ease of supervision, quality of equipment, and ease of extension for future needs are all important and are among the features that will be discussed later.

In all except some of the largest establishments it should be possible to get along with not more than two voltages for power and one for lights.

Since the feeders and branch circuits are the arteries of the power system, it is important that wire and cable be properly selected. Many advances have been made in the design and manufacture of cable during the past few years, with the result that many different combinations of insulation and protective coverings can be obtained to fit the service conditions.

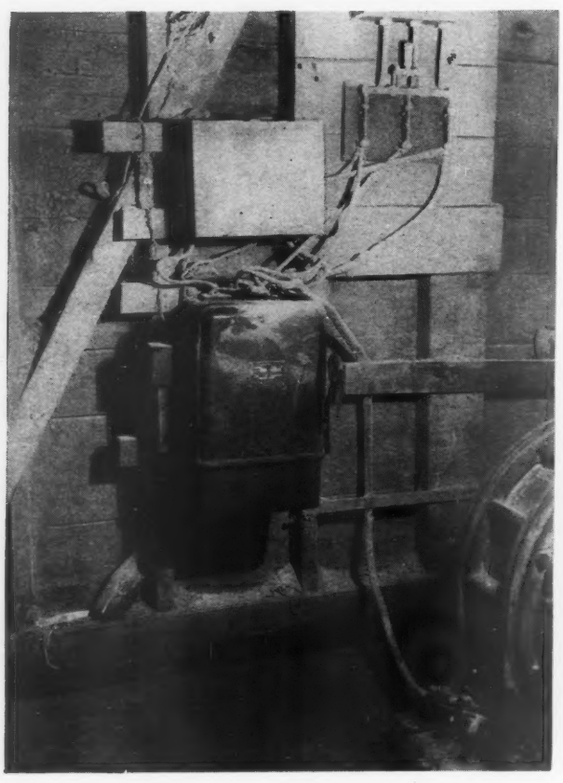
The types of insulation available today for industrial use include paper, varnished cambric, several types of rubber, asbestos, and so on. This subject will be discussed in more detail later.

Switching and Protection

Choice of the methods of installing wires and cables is dependent on the location of the machinery or other load, length of runs, amount of load, voltage, degree of reliability desired, and other factors. Naturally, these items are important since they affect directly the cost of the installation, the ability to maintain it, and the types of cable, insulation, and protective coverings required. In grouping circuits it may be advisable to consider a number of motors or other energy-consuming devices as a single "customer," and it may be well to provide one or more supply circuits for this group. Some motors in the group may require absolute freedom from power interruptions, whereas with others an occasional shutdown may not be serious. To provide the same degree of reliability of power supply for all motors may be prohibitively expensive. This matter calls for careful study.

Importance of simplicity and reliability in switching and circuit protection can hardly be over-emphasized. It should be possible to find, isolate, and clear troubles in the minimum time, but this feature should not be used as an excuse for making the faults themselves possible. Under normal conditions there should be no faults. Fuses should blow very seldom, and circuit breakers not trip under ordinary conditions. These actions should take place only in the event of accident or failure that could not be foreseen. Remember that when a fuse blows or a circuit breaker trips, it is not the fault of the fuse or breaker; these equipments are merely performing their functions correctly. The real fault usually lies in inadequate equipment, installation, or supervision.

(The next article will appear in an early issue.—ED.)



Use of the best equipment will not guarantee maximum service and freedom from trouble unless installation has been made in accordance with approved practice. The wiring in this installation, mounted as it is on a wooden panel on a wooden wall, gives evidence of being hastily put up. It may have saved some money, but certainly involves a lot of unnecessary risk. Only a firebug would recommend some of the things that have been done here

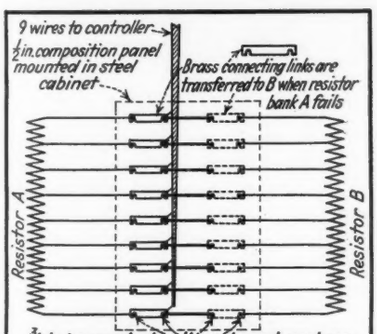
Operating Shorts

Spare Resistors for Electric Locomotive

GILBERT LINDGREN, *Assistant Chief Electrician, Hudson Valley Fuel Corporation, Troy, N. Y.*

A breakdown on our electric locomotive is a serious thing. It ties up our production completely until a steam locomotive replacement can be obtained. When a failure occurs to the starting resistors it requires about 1½ hours to replace them with a spare set.

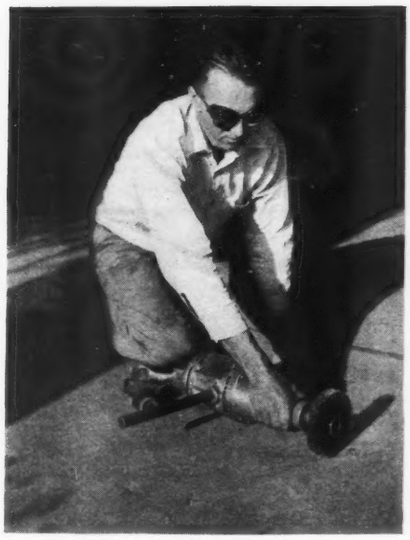
We have solved this problem by mounting a spare set in another space on the locomotive, and making up a terminal board as shown in the


9 wires to controller
½ in. composition panel mounted in steel cabinet
Brass connecting links are transferred to B when resistor bank A fails
Resistor A
Resistor B
⅜ in. brass studs with nuts and washers

sketch. Now when a resistor fails it requires but 5 minutes to connect the spare set.

Mr. Lindgren's contribution has been awarded the $10 *payment offered by the editors for the best Operating Short submitted during the past month.*

Wooden ice cream spoons make good drafting curves when regular curves aren't handy. Many common things can be outlined with them.



Refinishing Worn Spots on Painted Concrete Floors

ELTON STERRETT, *Longview, Tex.*

Blisters and bare spots appearing from time to time on a factory painted concrete floor needed refinishing. If a new coat of paint had been applied over them, an unsightly irregular surface would have resulted which, even under rubber-tired transfer trucks, would have made irregularities, increasing the impact of the wheels and causing breaks in the surface adjacent to the earlier blemishes.

An attempt was made to reduce the edges of these spots by hand, first with scrapers, then with wire brushes, without conspicuous success, due to the uneven application of effort and difficulty of tapering evenly the successive layers of paint.

By mounting an 8-in. stiff-bristle wire brush on the spindle of an electric drill motor, and supporting the handle end of the motor on an ordinary child's roller skate, a readily shifted surfacer was improvised which did the job quickly and well.

Touching the floor only under the skate wheels and at the brush, there was no drag of motor frame to mar the paint, and by controlling his position with one knee on the floor, the operator could apply the desired pressure to the spindle of the drill and cut away as much or as little of the floor coating as necessary.

Spots cleaned with this readily shifted brush rig, when primed with one coat of paint and then covered together with the remainder of the floor at the next coat, could be detected only under directed light, and offered no resistance to truck tires.

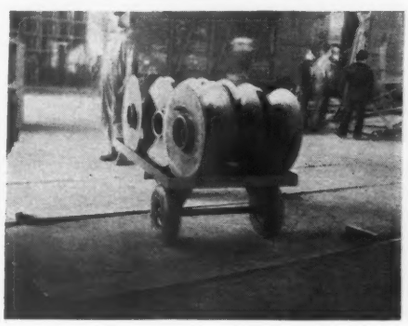
Like the kitchen furniture manufacturer who spills lemon juice, ketchup, vinegar, and the like on his product to test the durability of its finish, test your product under conditions approximating those of service.

Bridges Make Trucking over Rails Easy

JOHN E. HYLER, *Peoria, Ill.*

This is probably the simplest bridge to be found in many a day's journey. It is simply a plant traffic bridge used in the plant of R. G. Le Tourneau, Inc., Peoria, Ill., where a railroad track runs directly through the plant. It is necessary that much plant traffic cross the track, and, although the rails are level with the concrete floor, they cause some trouble to trucking, largely because they cross the traffic lane obliquely.

The bridge lies lengthwise along and covers one rail, there being two such bridges at the track crossing. The bridges serve a dual purpose. In addition to forming an easy crossing for the trucks, they form stops at each end so that it is impossible



for a railroad car to roll into traffic until the bridges have been moved.

The bridge is simply a strip of steel with short steel bars welded across the ends. It is laid flat on the floor and over the rail. Its length of about 10 ft. gives sufficient room for two trucks to pass. It is understood in the plant that traffic is not to cross the tracks unless and until these bridges are in place.

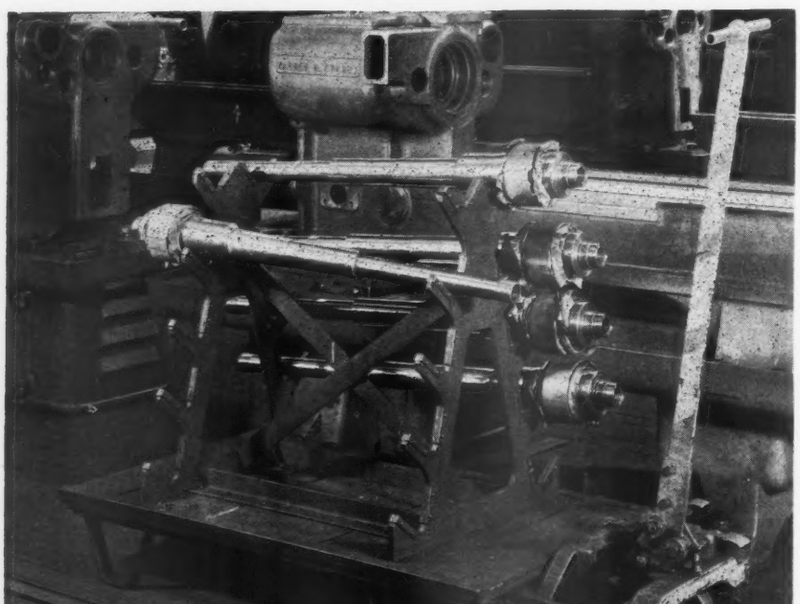
Where there is the slightest possibility that an eye accident *may* occur because of a certain operation, goggles should be worn.

Special Handling for Machine-Tool Spindles

Probably the most important part of any machine tool is its spindle. Upon the spindle depend the life and accuracy of the machine.

It's a real calamity if spindles, made of high quality steel, ground (and sometimes lapped) to exceedingly fine tolerances, are nicked or scratched in handling. Otherwise perfect spindles may be fit only for the scrap pile if their bearing surfaces are even slightly damaged.

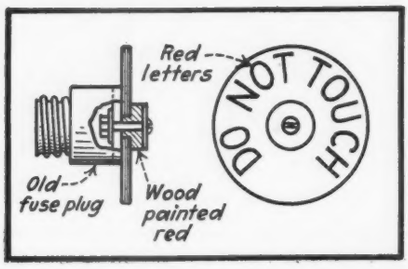
The Warner & Swasey Company, Cleveland, uses the special rack illustrated in handling its turret lathe spindles. The nests are sharply angled to prevent rolling or falling, and are equipped with copper liners. Racks are moved on skids by means of floor lift trucks.



Dummy Fuse Warns Meddlers to Keep Hands Off

T. G. Ellis, *Toronto, Ont.*

Trouble was formerly caused by unauthorized persons putting in fuse plugs that had been removed while sockets were being replaced or other repairs made. There was no telling when a serious accident would happen, because when a repairman is working on a supposedly dead line he does not take the precautions he would if the line were live.



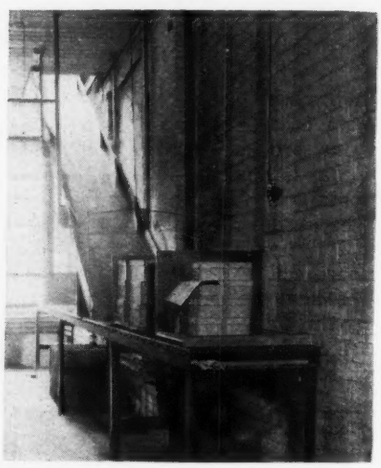
As a warning to meddlers we made up a dozen dummy fuses, as shown in the illustration. They were made from an old fuse of the type that carries a cartridge fuse, a piece of wood turned down on a lathe, and a fiber disk, all held together by a small bolt. The wooden piece holds the fiber disk in place and serves as a grip by which the plug can be screwed into the cutout. The disk is made a loose fit so that it can be turned freely in order to bring the lettering to the upright position.

Loads Slide Safely on These Pallets

H. B. Leach
Head of Standards Department
Pro-phy-lac-tic Brush Company
Florence, Mass.

When we decided to chute hairbrushes from final inspection and packing on the second floor to the stockroom on the first, it was plain that something had to be provided for the brushes to ride on. Hence the specially designed pallets shown.

Built of wallboard with reinforcing strips of wood that also serve as runners, these pallets have a conveniently hinged back. This back keeps the load in place during the rapid descent of the chute, then folds handily so that the pallets may be stacked when not in use or while being taken back to the point of use.



Loaded pallets slide onto a roller conveyor at the bottom of the chute. At this point they may be at once unloaded, or if necessary the lower portion of the chute, which is hinged, may be lifted and the loaded pallets moved back out of the way. This same gravity roller conveyor is used to move hairbrushes from the stockrooms to the immediately adjacent shipping floor.

For more than 10 years Barnes Drill Company, Rockford, Ill. has given each man a Christmas present of $5 for each year of employment.

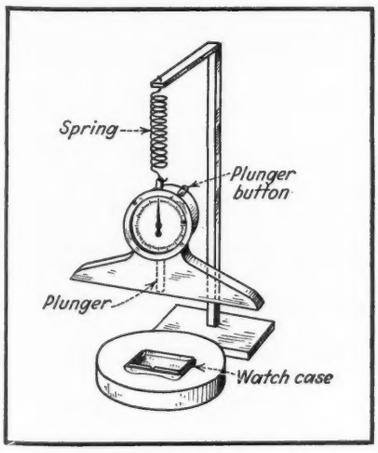
Good housekeeping at Pyrene Manufacturing Company, Newark, N. J., extends even to the parking area. To avoid confusion and waste of space numbered markers indicate definite parking positions. Each employee car owner is assigned a number and parks always in the space assigned him. A fence surrounds the lot, and the gate is kept locked except at start and close of day

Gage Saves Time in Watch-Case Inspection

VICTOR GELIN, *Industrial Engineer*
Benrus Mfg. Co., Waterbury, Conn.

Inspecting a great number and variety of wrist watch cases for depth was a problem for us. This operation we had been performing with a micrometer depth gage, and inspection was a slow process, costly and likely to hold up production.

The problem was solved by the use of a specially made dial depth gage, designed by us, and constructed to specifications by a large tool manufacturer. It consisted of a standard dial gage fastened by means of screws to a steel base ¼ in. wide, and suspended from a stand by a coil spring.



In operation, the inspector picks up a watch case from a tray at the right, examines the solder, places the case on a block under the gage. With her left hand she pulls gage down, presses plunger with right hand index finger, reads depth on dial to thousandths of an inch. After releasing the gage, she uses the left hand to move the case to a second tray at the left.

With this new set-up the operator is able to inspect cases for both soldering and depth in half the time it formerly took to measure depth alone.

Goggles worn by one employee should be sterilized before issuance to another. And it's wise to sterilize all goggles periodically.

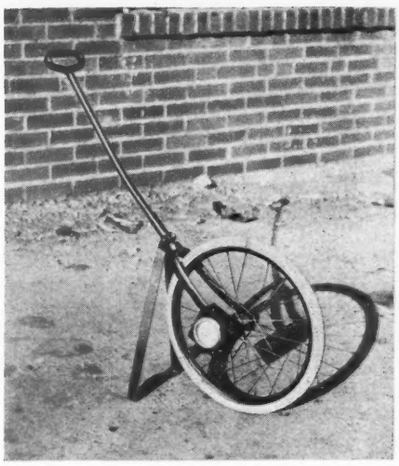
Measures Distances with a Tricycle Wheel

M. L. BARRETT, JR.
St. Louis County Water Company
St. Louis

We recently constructed in our shop an inexpensive device for measuring fairly great distances. It consists of a rubber-tired front tricycle wheel and fork, the latter extended about two feet by means of a 3-ft. length of ½-in. iron pipe, bent at the end to form a handle, and a water meter register dial geared directly to the shaft of the wheel. The dial and gears were mounted in a small box made from ⅛-in. brass plate bolted to the fork.

The gear ratio necessary to make the wheel measure in feet and tenths of a foot was computed after several trial runs over an accurately taped distance. Accuracy attained has been remarkably high. Over smooth concrete and asphalt surfaces it has been possible to measure to within 3 in. in 1,000 ft. As roughness of the surface being measured increases the accuracy decreases.

A small stand made from ⅛ x ¼-in. strap iron was attached so that the operator might stop at points along his route and make notes without having to lay the wheel down.



After painting the device and making minor adjustments we found its cost to be about $15. It has saved us considerable in time and labor, for where it took two men to make measurements before, one man can now do the job alone.

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Yesterday's Fireman's Tools Are Museum Relics Now

SOURCE, *Ford Motor Company*
Dearborn, Mich.

In an aisleway stands a complete set of the old-time fireman's tools: wheelbarrow, shovel, clinker hook, slice bar, ash hoe. The five tools are chromium plated on all metal surfaces; the hardwood handles of the wheelbarrow are stained and varnished in harmony with the rest. Thus are visitors and workers in Ford Motor Company's Power House No. 1 reminded tactfully and dra-

matically of how far the world of power generation has advanced, and, incidentally, how much hard, dirty work the modern power plant employee misses.

The aisleway where this exhibit stands is on the regular visitors' route. It is beneath an outside wall of windows, a cool spot where boiler room men come to air themselves. Whatever may have been the management's motive in setting up the exhibit here, it is certain that it constitutes a constant reminder to the men of how comparatively pleasant is the life of today's power plant worker.

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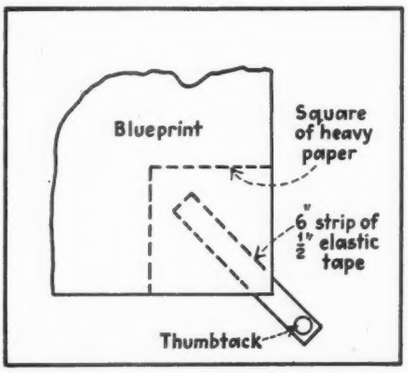
Mounted Blueprints Stay Flat Despite the Weather

A. E. MOUNTCASTLE, *Progressman*
United States Navy Yard
Charleston, S. C.

In this office we fasten a great number of charts and blueprints to boards hung on the wall. Heretofore, we have been bothered considerably by changes in the weather. When it was hot and dry the charts contracted to such an extent that either the tacks were pulled out or holes were torn in the charts. In wet weather the charts expanded so as to cause unsightly bulges to form.

We have eliminated these faults by gluing tabs of heavy paper, 3 or 4 in. square, to the blueprint or chart corners, and a 6-in. strip of ½-in. elastic tape to the tab. The tape is fastened by thumbtack to the board. There should be a slight tension on it, and it may be turned back double at the outer end to make the thumbtack's tearing through less likely. For large drawings additional tabs attach to the sides.

One word of caution—do not use



mucilage or paste as it will not work. A good grade of glue must be used. The first chart mounted by this method is still in position as tight as when first put up.

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Colloidal Graphite Prevents Seizing of Threads

SOURCE, *Acheson Colloids Corporation, Port Huron, Mich.*

Recent investigations indicate that vibration, temperature, and a possible electrical effect are as largely responsible for the binding of bolt threads as is rusting. Fortunately, colloidal graphite in aqeous dispersion, painted with a brush upon the previously cleansed metal portions, will overcome these difficulties.

Two such applications are advisable, each followed by drying. Frequently, best results are obtained by hot dipping the bolts or studs in dilute graphite solutions. Where gaskets are used on flanges, sticking is eliminated by impregnating the gaskets with a disperson of colloidal graphite in water, or by coating the gasket surface. Oftentimes, when bolts have become tight, penetrating oils containing colloidal graphite are effective in loosening them.

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Converting Minutes to Decimal Hours

D. KINNIBURGH
Engineering Department
Gerrard Co., Inc., Chicago

Of special value to time study and costs men is the "Table for Converting Minutes into Decimals of a Degree" to be found in *Machinery's Handbook.* Since a degree is divided into 60 minutes as is an hour, it follows that this table is applicable to converting time expressed in hours and minutes to time in decimal hour standards.

For example, to convert to decimal hour time 1 hr., 25 min. of bonus premium time, we refer to the table and find opposite 25 min. the equivalent 0.41666 hr. Consequently we express this time as 1.41666 hours.

Those who must take decimal hour times and convert them to hours and minutes can do so by reversing the process. Suppose we have the standard 1.68333 hr. Opposite 0.68333 in the table we find 41 min. Our standard is equal, therefore, to 1 hr., 41 min.

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Special Notice

$10 will be paid for the best Operating Short submitted during the month of May. The Editors are the judges. Other Shorts accepted will be paid for at attractive rates

Safety Instructions for Employees

ALMOST invariably when a serious accident occurs in the plant, the question comes up, "Was the workman sufficiently warned against the hazard?" If an operator on the punch press is injured because he removed the guard to the press, he can very easily contend that he was never told by his foreman or by anyone else that the press should not have been operated without a guard.

At a hearing in court or before an industrial commission, the workman's word that he was never warned is as good as the company's word, and in most cases the workman's word carries a great deal more weight.

In order to protect itself against this situation, the Wrought Washer Mfg. Co., Milwaukee, compiled a comprehensive set of safety rules covering every hazard that could be foreseen. These rules were printed up and distributed to all employees.

After allowing two days for the employees to read over the rules and digest them thoroughly, the company secured from each a signed statement that he had read the rules and agreed to abide by them. New employees at the time of their employment are presented with a copy of the rules and must sign the statement before going to work.

In the future when controversies over proper instructions concerning safety come up, the company will have on file a statement which cannot be overcome by verbal testimony of the employee involved.

Because such a set of rules should be of interest to other plants, the following list, based almost verbatim on Wrought Washers rules, is given. Credit is also due the U. S. Steel Corporation, whose comprehensive books on safety orders are acknowledged by Wrought Washer as having suggested many of its rules.

GENERAL

Although the company has tried to get up a complete set of safety rules, it is impossible to cover every possible item. If a rule on any particular danger has been left out, that shall be no excuse for carelessness or for disregard of common sense.

Foremen are not allowed to give orders that do not agree with these rules, except in cases where the rules themselves say a foreman should use his judgment.

Where these rules do not agree with legal requirements, the legal requirements must be followed.

1. *Care Expected of Employees*—Every employee is expected to use proper care in his work for his own personal safety and that of the men working with or near him. Unsafe conditions or practices must be reported at once to the foremen.

2. *Unusual Dangers*—If in their work employees meet conditions of great or unusual danger and do not know how to act, they must take the matter up with the foreman for proper instructions before doing anything. Employees must, under no conditions, take unnecessary risks.

3. *Drinking*—Drinking or the possession of intoxicating liquors on plant property is positively forbidden. No one will be allowed to stay on plant property who is under the influence of liquor in any degree whatever.

4. *Smoking*—Smoking is positively forbidden during working hours except in the mill and power house. Smoking is permitted when working overtime only upon special permission of the superintendent. Smoking is forbidden at any time where signs indicate special danger from fire.

5. *Horseplay and Fooling*—Horseplay and fooling, including scuffling, throwing articles, unnecessary talking or shouting, whistling, and other loud noises which may take attention of other employees from their work, is positively forbidden.

a. Running in the plant is not permitted.

6. *Warning Signs* — Employees must strictly obey all warning signs throughout the plant.

7. *Location of Work*—During working hours employees are required to stay in the departments where they are employed unless their duties call them elsewhere.

8. *Accidents*—When an accident occurs, conditions must not be changed until after an investigation has been made.

9. *Drinking Water*—Men should be cautioned of the danger from drinking too much cold water when they are hot.

10. *Violations*—Violations of safety rules by other employees must be reported to your foreman.

HOURS AND PAY CHECKS

1. *Lateness*—Employees must be in the plant and at their job ready to work when the final whistle blows to mark the beginning of working hours. The first whistle sounds five minutes before as a warning. Employees who have the habit of getting to the time clock just before working hours, and so taking up time to get to their jobs, will be disciplined.

2. *Quitting Time*—Work is not to be stopped until the whistle blows at noon or at quitting time. Any time needed to wash up and get out of the plant is to be taken after the whistle blows. Do not rush at quitting time, or crowd around time clock.

3. *Pay Checks*—Pay checks will be given only to the employee himself and only on regular pay days or any day thereafter that the plant is operating. However, if an employee is unable to call in person, the check will be given to someone else if he tells the company to do so in a signed statement.

CLOTHING

1. *Clothing in General*—Wear no loose or ragged clothing. Torn or loose overalls are forbidden. Overalls and clothing must be reasonably free from oil or grease. Long neckties and finger rings are dangerous—employees operating presses and machinery are not allowed to wear them.

2. *Shoes*—Employees are expected at all times to wear shoes that are in good condition, and holes in the soles or loose soles are strictly forbidden. The wearing of low shoes in the mill shall be discouraged and positively forbidden in departments where there is molten metal. The wearing of tennis shoes is not allowed in any department. Safety shoes are recommended.

3. *Hair*—Women employees working in the plant must wear a covering over their hair or see that it is held together in some other way.

4. *Hands*—Hand leathers are recommended for handling material.

PLANT HOUSEKEEPING

1. *Toilets*

a. Gloves, rags, waste, etc., must never be thrown into toilets.

b. Employees are forbidden to take newspapers or magazines into toilet rooms. There is always enough toilet paper.

c. Food, tobacco, etc., must not be thrown into bowls of drinking fountains or urinals.

2. *Refuse*—Employees must not throw

Prepared by EUGENE CALDWELL, General Manager, Wrought Washer Mfg. Co., Milwaukee

wire, scrap, oily waste, food scraps, waste paper, or other refuse on the floor inside the buildings, or out of the windows. All refuse must be put into the cans especially provided.

3. *Locker Rooms* — Wearing apparel, including coats, hats, shoes, must be kept in the locker room and must not be hung around the wall, on pipes, etc., in the plant.

4. *Blocking Passageways, Etc.*—Employees must not pile or leave material, tools, or appliances in such a position as to be in the way on any active platform, runway, truckway, aisle, door, firedoor, exit, fire escape, stairway, or equipment. Holes or other defects in platforms, runways, truckways, floors, stairways and aisles which may make them unsafe for trucking or walking upon, must be reported to the foreman promptly.

5. *Nails*—Nails that stick out must be bent down or removed by anyone who sees them.

6. *Parts Sticking Out*

a. Set screws, keys, etc., must not be allowed on open revolving parts of machinery.

b. A chuck or key wrench must never be left in a chuck.

7. *Scrap*—Keep all scrap cuttings and unnecessary lumber off the floor, especially around machines.

8. *Piling Material*

a. Material on floors must be so piled that it will not fall.

b. Material must not be piled against any wall or structure so that wall or structure will be damaged by the weight leaning against it.

c. In taking material from stock piles, be sure pile is safe before you begin work. If in doubt call the foreman.

d. In taking material from stock pile, do not undermine the pile or otherwise make it dangerous.

MACHINERY OPERATION AND REPAIR

1. *Authorized Operators*—No machines are to be operated unless the employee has been told to do so, or unless it is a part of his job.

2. *Mechanical Safeguards*—Employees must use all mechanical safeguards and safety appliances installed by the company. Whenever any of these guards or appliances are displaced for repairs, tool setting, or for any other reason, they must be replaced in proper position before machinery is started.

3. *Testing Safety Devices*—Devices for stopping machinery or shafting must be examined or tested by operator at start of each turn, and anything wrong reported to foreman or person in charge (Does not apply to engine stops and others where special periodical inspections are specified.)

4. *Starting Machinery*

a. When starting the machinery or shafting in any department, either by engine or motor, clutch, sheave, or in any other manner, proper signals and care shall be used to warn all who might be injured by the machinery.

b. Before starting a machine, be sure that all wrenches and loose materials are removed from it. Ample time must be given for everyone to get into the clear.

5. *Cleaning and Repairing*

a. Oiling, wiping, cleaning and repairing of machinery must be done while such machinery is not running. No one but regular oilers is allowed to work near revolving shafting, or over unguarded machinery in motion.

b. While electrically driven machinery is under repair, the main switch must be tagged in the open position by the employee in charge of the repair job. Where more than one gang is working on the same job, the gang boss must make sure that his gang is protected by their tag. The tag is to be taken away only by the person placing it there. While engine-driven machinery is under repair, either the standard tag must be hung upon the engine throttle to be taken away only by the person placing it there, or the throttle must be made tight by lock and chain.

c. Never remove a danger tag or sign for any reason whatsoever unless you have placed it there yourself.

d. Repairmen must not operate machinery unless told to do so. If the work makes it necessary to turn the machine over, it must be done by an authorized person.

e. No repair job will be considered complete until all guards and safety appliances have been properly replaced, nor until all left-over material, tools, scaffolds, etc. have been removed.

f. Do not open or close a switch without knowing to what lines or machines it is connected and what the results will be.

6. *Defective Machinery and Tools*—Employees must not use any machinery, tools, or appliances that are in such need of repairs or adjustments that using them might result in accident or personal injury to themselves or others. Such defective machinery, tools, or appliances must be reported to the foreman and taken out of commission immediately, and a "Bad Order" tag attached, until the necessary repairs or adjustments have been made.

7. *Use of Tools*

a. Tools must not be used for anything but their real purpose. For instance, a file or monkey wrench for a hammer; a file for a pinch bar; a screw driver for a chisel, etc.

b. Wherever possible, use a solid wrench instead of a monkey wrench, and see that it is in good condition and fits the nut properly.

c. Files must be used with handles and for filing only.

d. All tools such as chisels, key drifts, cold sets, etc., must be kept in good condition. The use of burred tools is not permitted.

8. *Motor Driven Machines* — Operators of individual motor-driven machines must not leave their machines while motor is running.

ELECTRICAL

1. *All Wires Dangerous*—All wiring should be considered live and dangerous until the contrary has been proven. A telephone wire can be in contact with a high voltage wire, and insulation is not always enough protection. Experienced electricians only shall repair electrical equipment.

2. *Portable Electrical Equipment* — When using portable electrical appliances such as drills, etc., the current must be shut off before laying them down.

3. *Defective Equipment*—Poor socket connection, poor plugs, or electric extensions with kinks must not be used. Such defective equipment should be removed for repair at once. Extensions must not be used without a guard over the light bulb.

4. *Safety Stop Switches*—Locate and remember all safety stop switches. The time may come when you will want to act quickly.

5. *Tampering* — Wedges in starting boxes or on any other protection to prevent tripping on low voltage will not be permitted. If the controller does not stay in the operating position, report it to the foreman or electrician.

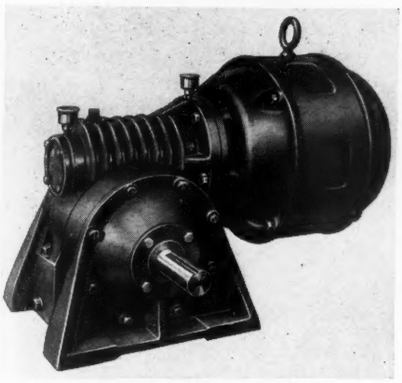
6. *Power House*—Three blasts of the main whistle during working hours means that the electrician and assistant electrician should come to the power plant at once.

What's NEW in Equipment

Reflector

This 250-watt mercury, inclosed-aluminum-dome-type, low mounting lighting unit provides intensive general illumination where mounting height is not over 20 ft. Higher intensities are provided on working plane, with minimum losses on side walls. Consists of deep-bowl-type reflector, dusttight cover, various types of hoods for ½-in. conduit and outlet box mounting. Reflectors are made from 16-gage alumninum sheet. Medium socket is rigidly mounted in hood. Clear glass cover is hinged directly to reflector bead, and is supported at three points. Heavy waterproof felt provides gasket between reflector and lens. Westinghouse Electric & Mfg. Co., East Pittsburgh.

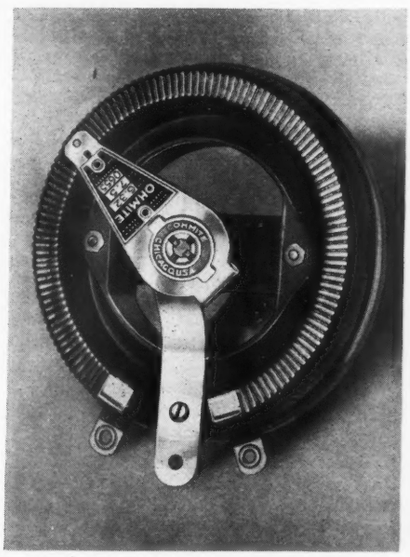
Geared Motor Reducer



"IXL" Fractional Horsepower Powered Gears comprise a complete line of geared motor reducers. Sizes range from 1/50 hp. to ¾ hp. in ratios from 2:1 up to 8,000:1. Various types include single- and double-reduction worm gear, single-reduction helical gear, and combination worm gear and planetary gears. Units are styled to give pleasing appearance. Foote Bros. Gear and Machine Corp., 5301 So. Western Blvd., Chicago.

Rheostat

Model "U" power rheostat is rated at 1,000 watts. It is 12 in. in diameter. Construction is of metal and ceramic material throughout, with nothing to smoke or char. Resistance wire is wound over a horseshoe-shaped porcelain core mounted



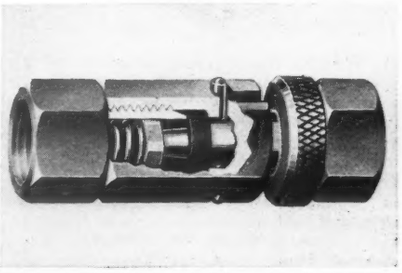
on a porcelain base. Entire unit, except contact surface, is covered with vitreous enamel fired at high temperature. Shaft and bushing assembly is insulated from live circuit by porcelain. Spring-held contact assures uniform contact. Ohmite Mfg. Co., 4835 W. Flournoy St., Chicago.

Fans

Two new models in line of air circulating fans. The name, "Roto-Beam," indicates the principle of design, namely, a design such as to produce a moving beam of air whirling helically, causing a suction which draws the air from the lower, upper, and all intervening sections of the blade. Entire unit is said to be carefully designed for high efficiency of air movement. Available in 8-, 10-, 12-, 18-, 20- and 24-in. sizes; three-speed models; a.c. and d.c. A.c. single-speed models can also be obtained. Roto-Beam Corp., 3300 Indiana Ave., Chicago.

Coupler

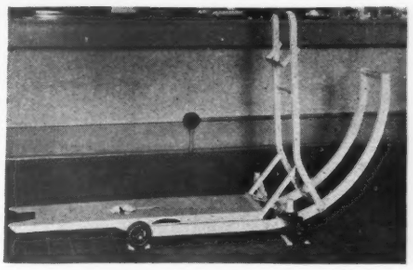
"Ritex" coupler for air and gas lines has automatic shutoff valve. When line with plug-end is detached, valve operates to stop



flow; when plug is connected again, flow automatically starts. Both coupler body and coupler plug come in ¼- and ⅜-in. sizes, male and female threads. Industrial Specialties, Inc., 608 Sixteenth St., Oakland, Calif.

Lift Truck

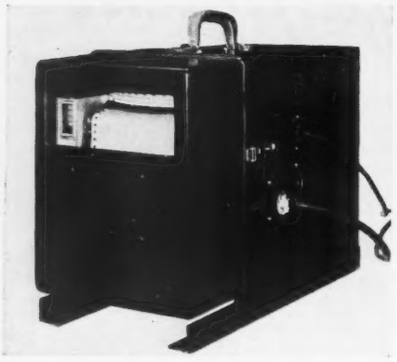
No. 9324 lift truck is light in weight, but has capacity of 1,500 lb. Can be used for transporting equipment or platform having leg height ranging from 4½ to 17 in. There are five stages of lift, and the adjustment between the five stages of platform height can be made instantly. Has swivel-type wheels in rear for easy turning of corners. Wheels are rubber-tired. Overall dimensions: length, 72 in.; width, 24½ in., height, 34½ in. Arcade Mfg. Co., Freeport, Ill.



Welding Tester

The "Arcronograph" provides a constant method of inspection during welding. For each type and size of electrode, it produces a chart of definite appearance as representative of the normal or desired performance. Irregularities of harmful magnitude cause sufficient deviation from the normal chart that the interpretation is simple enough to the welder after he becomes

acquainted with the relationship between record and the weld metal. After a satisfactory record has been made, any irregularities moving outside limits established in that record call for an inspection to see whether or not the welding job is satisfactory. The amplitude of the record and the time element of the disturbance can be



observed by the operator after he finishes depositing an electrode. The instrument is self-contained and portable, and operates in parallel with the welding circuit. It has voltage range of 20 to 45 volts for normal operation. It requires about 60 watts from a fairly steady source of a.c. Record is produced on a 5-in. strip chart so arranged that it moves only when the welding voltage is within the operating range. Normal chart speed is 3 in. per min. Rubicon Co., 29 North Sixth St., Philadelphia.

Electric Pliers

No. 10 "Thermo-Grip" electric pliers are an electrically heated soldering tool for soldering lugs up to 1,050 amp., or sweating pipe fittings up to 2½ in. diameter,

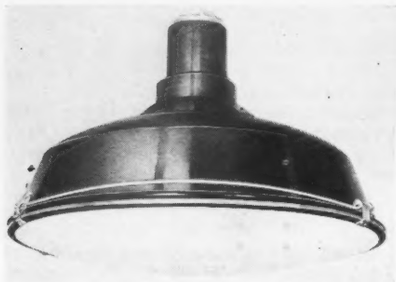
under continuous operation. When used only intermittently the pliers will handle pipe or fittings up to 4 in. in diameter. It is claimed they sweat joints without unsweating adjacent connections, hold work firmly while soldering, heat the work evenly from both sides, eliminate open flame hazards. Line current from which they operate is reduced to a harmless low voltage so that no shock is possible. Ideal Commutator Dresser Co., 1831 Park Ave., Sycamore, Ill.

Jack

No. 2029 heavy duty automatic raising and lowering jack has capacity of 20 tons, can lift 18 in. Weighs 100 lb. and is 28½ in. high. Simplified mechanism includes triple-toothed pawls, and rack bar is heat-treated, chrome nickel steel forging. Base has large area and is arched for stability and strength. Furnished with a 6-ft. oval second-growth hickory lever pole. Templeton, Kenly & Co., Ltd., 1020 South Central Ave., Chicago.

Reflector

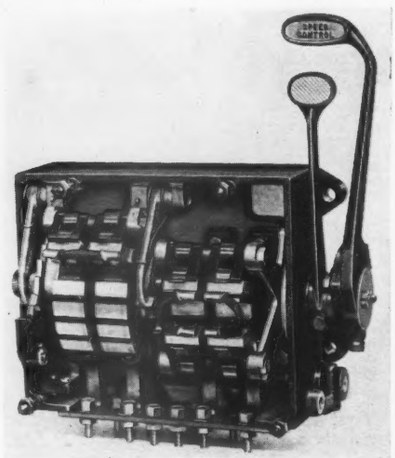
For lighting applications where mounting heights of from 8 to 18 ft. are encountered, this inclosed dome-type reflector for 250-watt mercury lamps has been designed. Consists of an 18-inch-diameter porcelain enameled reflector with various types of hood mountings and a dusttight hinged glass cover. Convex lens used in the cover is acid etched on inside and smooth on outside. Entire assembly provides wide uniform distribution of light and diffusing lens minimizes the glare. Reflector is drawn from 24-gage iron sheet. Outside



surface is finished in green porcelain enamel, inside in white. Uses medium socket. Glass cover is hinged directly to reflector bead and is supported at three points. Waterproof felt gasket between reflector and lens. Westinghouse Electric & Mfg. Co., East Pittsburgh.

Truck Controller

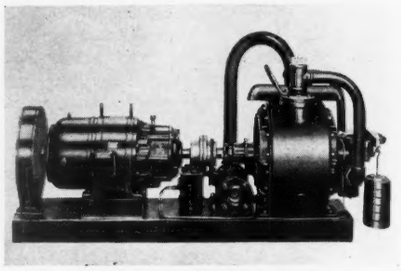
"Rotor-Brush Power Flow Controller" is a new type that is to become standard on all the company's tractors and trucks. Has motor-type brush mounting which is rotary in action. Stator segments are commutator type and are unit molded into an insulated base. Features claimed by manufacturer are reliable voltage control, smooth power performance, and long mechanical life. Brushes have constant spring tension, which is self-compensating and requires no



manual adjustment. All hand or all foot control, or combination of both can be had. Automatic Transportation Co., 101 West 87th St., Chicago.

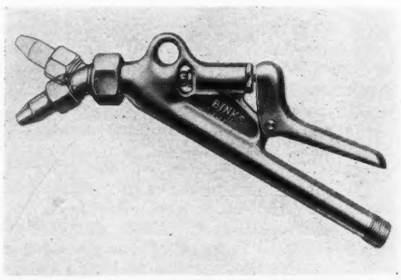
Aircooled Gas Booster

This aircooled gas booster is claimed to operate efficiently on heavy work in warm places. Compensator is said to assure steady pressure at high or light loads. Pressure is controlled, so that when discharge of compressor is reduced, motor is automatically unloaded proportionately. Booster requires no foundation and can be adapted for portable use. It has force feed lubrication, and is furnished with a separator that separates oil from gas. Lammert & Mann Co., 221 North Wood St., Chicago.



Flow Gun

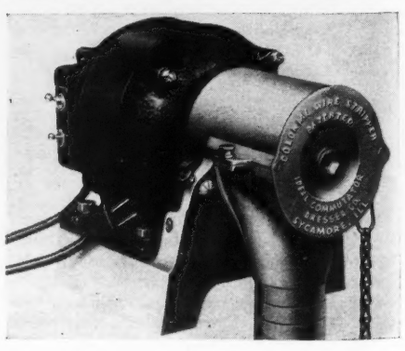
Model 12 flow gun is designed for application of sealing compounds, such as rubber cement, emulsified asphalts, and similar heavy materials. Uses no atomizing air, but simply "flows" the material under air pressure from a pressure material tank. Can be furnished with nozzles that will lay a heavy line from ¼ to 6 in. in width. The air pressure on tank varies with the viscosity of material and length of hose used. For sealing materials in ordinary use with 15 to 20 ft. of ½-in.



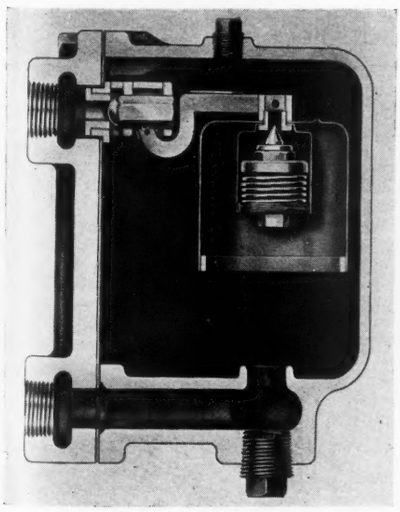
hose, the recommended air pressure is from 15 to 20 lb. Possibility of clogging is reduced to a minimum, because passage from material inlet to nozzle is almost straight. Nozzle can be swiveled in any direction. Material connection is standard ½-in. pipe thread. Nozzles are ¼, ⅜, and ½ in. round. Binks Manufacturing Co., 3114 Carroll Ave., Chicago.

Wire Stripper

"Colonial Wire Stripper" has reversible motor that makes it possible to strip wires either from left to right or right to left. It employs principle of centrifugal action,



eliminating necessity for springs and levers. Double-edge blades in stripping chamber fly outward in motion, and a slight pressure on the foot pedal closes blades to within 0.001 in. of the diameter set by the dialed micrometer gage. When wire is inserted into the stripper, insulation is cut clean, the wire properly twisted and polished. Stops can be instantly set for any length of strip up to 2 in. Has ¼-hp. heavy duty ball bearing motor. Flexible metal tube carries waste strippings to disposal container. Ideal Commutator Dresser Co., 1416 Park Ave., Sycamore, Ill.



Steam Traps

Inverted bucket trap is available in sizes from ½ to 2 in., with bodies of cast iron for 125 lb., semi-steel to 250 lb., and cast steel up to 500 lb. steam pressure. Valve heads and seats in all types are of stainless steel. Can be furnished with integral air bypass carried inside the bucket and consisting of a regular thermostatic trap element of the balanced pressure type. It is said that this trap operates satisfactorily regardless of pressure fluctuations in the trap. Sarco Co., Inc., 183 Madison Ave., New York.

Wire Coil Truck

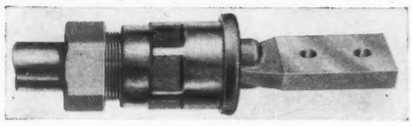
This truck is designed for use where quantities of wire coil must be transported. Its end plate is only 1¾ in. from the floor, permitting operator to roll coils on platform from rear. It may be loaded from either side. Because of the low clearance, coils are quickly and easily loaded. Corrugations on the deck hold them in place. Overall length is 56 in. Has 8-in. wheels equipped with roller bearings in the rear. In front it has lock-pin assembly to which Clark Lift Jack attaches when truck is ready to be moved. All-Steel Welded Truck Corp., Rockford, Ill.

Pneumatic Hammer

Pneumatic hammer designed to be used for automobile fender straightening work comes with four sides which fit all flat and curve surfaces, making it possible to use this hammer for all sheet metal straightening jobs. This "DeLuxe Model Hammer" requires air pressure of 75 lb. There are only two moving parts in the hammer head mechanism, the striker moving inside of a floating piston. Control of speed and power strokes is achieved by means of an air valve. Pressure on trigger starts hammer; release stops it instantly. Full speed is 4,000 blows per min. Weaver Mfg. Co.. Springfield, Ill.

Cable End Seal

Type "FT" cable end seal is to be used for terminating and sealing 600-volt cables. Consists of a copper terminal lug having a gasketed flange, a plastic insulator, sealing bushings, and brass packing nut. Assembled unit gives a definite oil- and moisture-tight seal for the end of the cable.



Can be used on lead-covered or non-leaded cable with paper varnish cambric, or rubber insulation. Two sizes: 250,000 and 500,000 circ.mil. G&W Electric Specialty Co., Inc., 7780 Dante Ave., Chicago.

Pump

Type "SC" Vortex pump is a single-suction, centrifugal pump, especially designed to handle corrosive liquids and to be furnished in a wide selection of special alloys. Can be had in stainless steel, pure nickel, Monel metal, Everdur, acid bronze, lead, and aluminum. Each pump is made to user's particular needs. Has ball-bearing construction, deep stuffing boxes, and vertical split casing. Lawrence Pump and Engine Co., Lawrence, Mass.

Resin

Synthetic resin is transparent, looks like ordinary glass, has properties of resin. Is flexible, colorless, has heat conductivity one-third that of glass. Transmits large percentage of ultra-violet light. Can be formed into curves, is light in weight. "Plexiglas". Rohm & Haas Co., Inc., West Washington Square, Philadelphia.

Chain Wrench

No. 887 chain wrench has capacities of ½ to 4½ in. It has a 12-in drop forged handle and an extended pin-type chain 15¾ in. long. It is designed for large nut or pipe turning jobs in close inaccessible places where long leverage is not essential. Owatonna Tool Co., Owatonna, Minn.

Panel Instruments

Type 35 miniature meters are available in round and rectangular designs in a.c., d.c., rectox and radio-frequency types. They can be used as ammeters, milliammeters, microammeters, voltmeters, millivoltmeters,

power level meters, and volt-ohmmeters. Entire line employs but two types of mechanism. Mechanisms have high torque-weight ratios and low volt-ampere burdens. Capacities as low as 20 microamperes are available in moving-coil types. Self-contained ammeters of 50 amp. and voltmeters of 200 volts are available. Instruments are rated at 750 volts, which corresponds to a test of 2,500 volts between terminals and panels. Westinghouse Electric & Mfg. Co., East Pittsburgh.

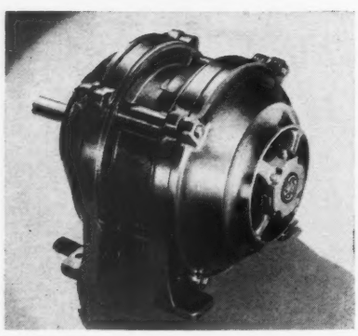
Hand Truck

This hand truck is designed especially for handling gas cylinders. It is of tubular steel construction, electrically welded throughout, with cadmium plated, steel disk, ball-bearing wheels. Wheels are equipped with low-pressure pneumatic tires. Rubber handgrips of motorcycle handle-bar type. Cylinder is supported beneath by a flattened extension of the frame toward the center from either side. It is also supported by two tubular crossbeams formed in an arc to cradle the cylinder so that it cannot roll off the truck. Moellenbrock & Wilke, Washington, Mo.

Steam Hose

Constructed of rubber tube wound with four plies of high-strength asbestos cord alternating in direction. Cords are rubber cushioned and rubber wrapped. Inside diameter sizes of ½, ¾, 1, 1¼, 1½ in. For 175–200-lb. pressures. U. S. Rubber Products, Inc., 1790 Broadway, New York.

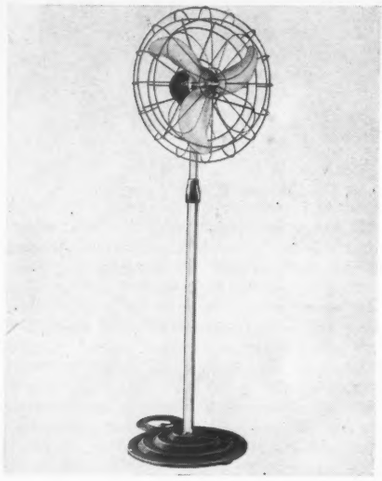
Motor



Screenless open motor for textile service. Ventilating system is designed to give positive lint expulsion. Any free lint or dust in ventilating air is forced through large unobstructed air passages and is discharged through large openings in stator frame. Motor has rotor with a cast aluminum winding and smooth solid end rings. Cast fans are securely keyed to the shaft. End frames are of malleable iron, and outer and inner rings and crosspieces form an arched truss of great rigidity. Large openings are shaped and located to direct air to fans without intervening baffles. Inside surfaces are smooth, and clearances are of generous size to assure easy passage of lint. Winding insulation is highly resistant to oil, mild chemicals, and moisture. Motor feet are cast integral with frame. Convenient knockoff ledges permit quick and easy disassembly without risk of damage to motor. General Electric Co., Schenectady, N. Y.

Fans

Quiet air circulator fans are of 3-blade, 2-speed type, and can be had in 24- and 30-in. sizes. Available with ceiling, wall bracket, center column, or adjustable floor-column mounting. Motor is of resistance, split-phase induction type, totally inclosed. Fan blades are highly polished and have black enameled guards. Motor is also finished in black enamel. Wagner Electric Corp., 6400 Plymouth Ave., St. Louis.

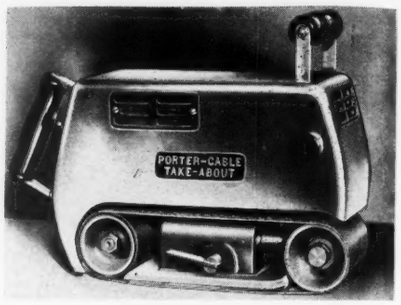


Conveyor Switch

Radial switch for use with roller conveyors operates by pushbutton. Power-driven, pressure on the button causes it to open to discharge position, and after material has passed over it, it returns to normal position without further attention. Rollers comprising its short section are power-driven positively, no matter if the switch is in position for straight-ahead travel or for discharge to a lateral line. Available in different types for heavy or light handling, being suitable for light cartons, tote pans, drums, or coils. Standard Conveyor Co., North St. Paul, Minn.

Sander

"Take-About" Sander, Type T-4, is a balanced portable machine using a 4x27-in. abrasive belt. Can be used for surfacing new or old wood, removing paint, shellac, varnish, or other finish materials. Can also be used for light metal grinding operations, and on composition or plastic materials. Frame is polished aluminum. Both handles are non-metallic. The rear or driving pulley is operated through a silent transmission powered by a 1¼-hp. universal motor of any voltage required. Belt speed is 1,650 r.p.m. Porter-Cable Machine Co., Syracuse, N. Y.

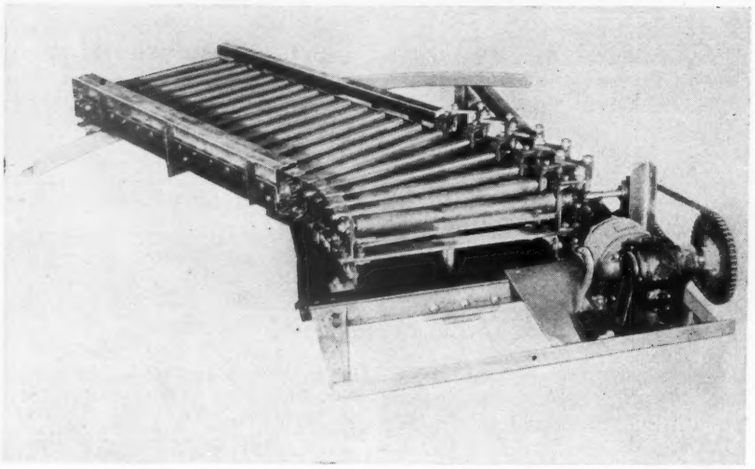


Control Valve

No. 350 air-operated diaphragm control valve is said to have good flow characteristics. A universal ball joint design centralizes all movement of the diaphragm to the lower valve stem, resulting in smooth, even action. Valve body has been designed with the intention of eliminating all possible friction. Adaptable to air-pilot-operated instrument controllers and air-pilot-operated liquid level controllers, external or internal float type; also with air-pilot-operated pressure-reducing or back pressure controllers. H. Belfield Co., 435 North Broad St., Philadelphia.

Reflector

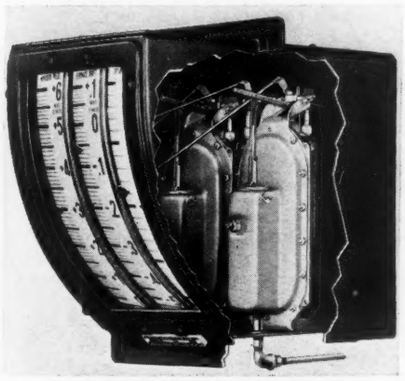
This 250-watt, symmetrical angle reflector is designed for use with high-intensity mercury lamps. The reflector with diffusing glass cover is designed to give widespread distribution of light horizontally, and an even distribution of light from top to bottom of the vertical surface. Reflector is drawn from 24-gage iron sheet. Outside is finished in green porcelain



enamel, inside is white. Acid etched glass cover is hinged directly to reflector bed, and is supported at three points. Heavy waterproof felt provides gasket between reflector and lens. Westinghouse Electric & Mfg. Co., East Pittsburgh.

Gage

Diaphragm - operated "Multi - Pointer Gage" for boiler room service. Most important feature of this device is its diaphragm material which has great flexibility and is said to be resistant to oil, acid, caustic, and heat. Diaphragm area of 20 sq.in. also lends to its sensitivity. Unit consists essentially of a flat calibrated spring, a sealed link, and a power dia-



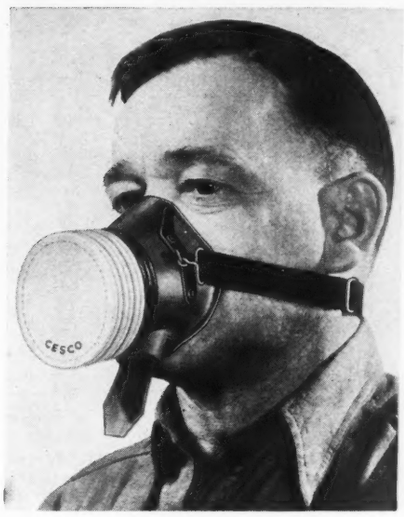
phragm the weight of which is carried on the second link pivoted at one end on the calibrated spring and the other spring on the sealed link. To indicate draft, connection is made to one side of the diaphragm; for pressure, to the other. Has zero adjusting screw which may be turned from outside the case. Available in cases containing from 1 to 12 units. May be surface, semi-flush, or full-flush mounted. Bailey Meter Co., Cleveland.

Welding Electrodes

Una 3175 and 3195 welding rods are designed for use in welding low-alloy, high-tensile steels. Of shielded-arc type they have alloy-base rod with full shielded coating. Can be used for flat, vertical, or overhead welding. Sizes 1/8 and 5/32 in. Una Welding, Inc., Collamer Ave., Cleveland.

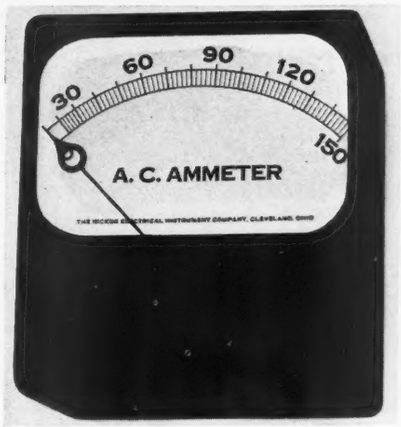
Respirator

Cesco No. 90 Healthguard Respirator is designed for use in Type "A" dusts (those tending to produce silicosis). Has one large area filtering surface and a very sensitive outlet valve, permitting no inside air pressure. Use of soft metal band makes possible effective seal at the facial contour. It is also said that this band makes possible reduction of headband pressure to the point where it is practically unnoticeable. Chicago Eyeshield Co., 2300 Warren Blvd., Chicago.



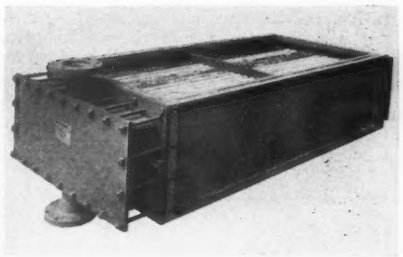
Switchboard Instruments

Line of 6-in. square surface mounting switchboard instruments contains a.c. voltmeters, ammeters, wattmeters, synchroscopes, frequency meters and power factor meters. Design is a new development in magnetic vane instruments, resulting in scales of high uniformity from $\frac{1}{3}$ to full scale. Cases are of steel. Mounting is either front of board or flush. All models are dampened approximately 95 per cent, and all are equipped with external zero adjuster which is insulated from the electrical meter circuit. The Hickok Electrical Instrument Co., Cleveland.



Lining Material

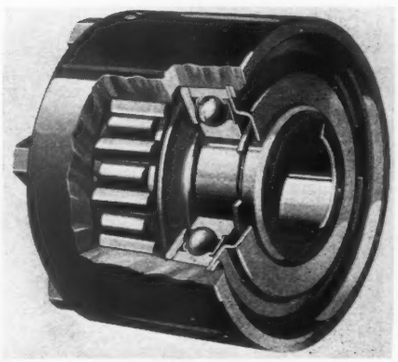
"Duromit" can be applied as a tank or bunker liner after corroded steel or deteriorated cement has been cut away. Walls are first coated with a bonding cement; then lining material is mixed with cement and troweled smooth. Surface, after drying, is resistant to acids, abrasion, and fumes. American Fluresit Co., Rockdale Ave., Cincinnati.



Air Coolers

These coolers are designed to cool air or other gases for turbo-generators, synchronous condensers, waterwheel generators. Where surrounding air is moist or contains corrosive acids or dust, use of this type cooler protects windings and insulation. Body consists of two structural steel plates bent to form a rigid channel. These plates are fastened together by cross members which are welded to sides of the cooler. Water boxes are fabricated from copper-bearing steel. Cooling surface consists of Admiralty metal tubes upon which spirally wound copper fins are mounted. Tubes are rolled solidly into Muntz metal plates. It is possible to remove any single tube without disturbing adjacent tubes. Coolers suitable for use with fresh or salt water can be obtained for all sizes of generators. Westinghouse Electric & Mfg. Co., East Pittsburgh.

Clutch

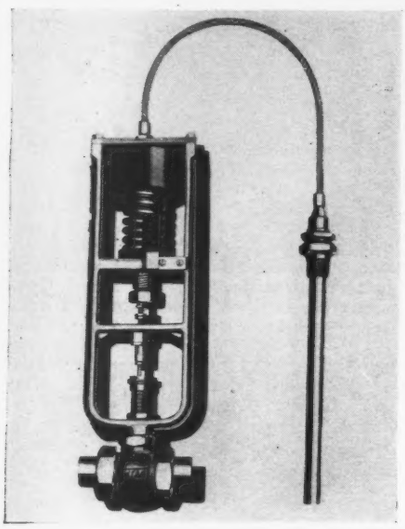


High-torque indexing and free-wheeling clutch has many uses. Multiple cams are used, spaced alternately with hardened ground steel rollers to distribute the load evenly on each cam. Cam action is governed by two leaf springs that contact shouldered surfaces milled at each end of the cam. Point of spring contact is such that a rocking action is created with the fulcrum point at center of the cam. Thus, when speed of inner and outer races synchronizes, the cams immediately roll into locking or driving position. A ball bearing at one end separates members and stabilizes the load. Opposite end of the unit is prepared for attachment of sprocket wheel, ratchet arm, or belt pulley. Self-lubricated. Morse Chain Co., Detroit.

Controller

Improved model of self-operating temperature and pressure controllers. Improvements include a new design of flexible, seamless metal bellows and numerous minor refinements of design and material. Suitable for applications where close con-

trol obtainable with auxiliary power is not necessary, or where the steam pressure available is less than 10 lb. per sq. in. Temperature ranges are approximately 75 deg. between limits of 30 and 450 deg. F. Valves are semi-balanced, in sizes from ½ to 2 in. C. J. Tagliabue Mfg. Co., Park & Nostrand Ave., Brooklyn, N. Y.



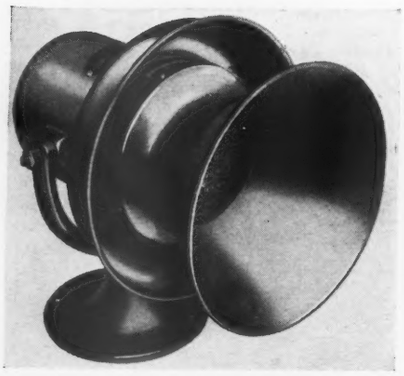
Rotating-Cam Switches

CR3300 rotating-cam switches are designed especially for built-in control applications. For non-built-in applications the switches are available without the flanges used for flush mounting. Two sizes: Size 0 is rated at 15 amp. continuous, Size 1, 25 amp. continuous. Both are for 600 volts or less, a.c. Four standard types are available for controlling 1-, 2-, and 3-speed motors in reversing and non-reversing applications. On the Size 1 switch, the terminal consists of a slotted stud

at one end of a post which has a stationary contact on the opposite end. The connecting wire is inserted in the stud slot and is held there by a square washer and hexagon nut. Terminals for the Size 0 switch are standard binding-screw type. General Electric Co., Schenectady, N. Y.

Sirens

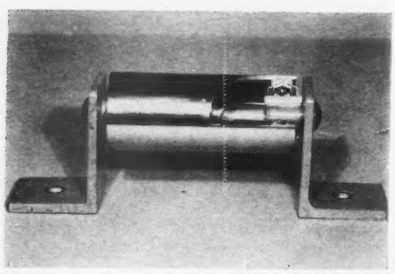
Type D has low pitch tone that is said to penetrate above factory noises. Siren has no vibrating parts and can be used outdoors as well as indoors. Weatherproof housing. Can be used as stop and start signal, warning signal, or call signal. Has universal motor operating on 6 to 250 volts



a.c. or d.c., any phase or cycle. Grease-sealed ball bearing. Painted in red or aluminum. Federal Electric Co., 8716 South State St., Chicago.

Roller Conveyor

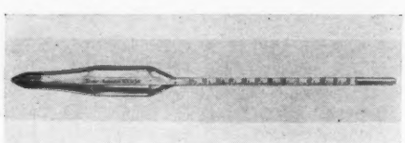
Simplified type of roller conveyor consists of roller with tubular axle frame and locking pin. Conveyor can be shipped assembled or knock down. Assembly is easily made by driving locking pins through holes in the frame into the tubular axles which are expanded, locking the frame and bearings together. At the same time they force a rigid crossbrace. Rollers are equipped with double dust seal lubricated-for-life bearings. Holes for roller



spacing are on 2-in. centers, making it possible to vary spacing of the rollers as required. For light conveyor, rollers of steel tubing are 1¾-in. diameter, 16 gage; 2½-in. diameter, 14 gage. For heavy conveyor, rollers are 2½ in. in diameter, 11 gage. Eastern Corp., 420 Lexington Ave., New York.

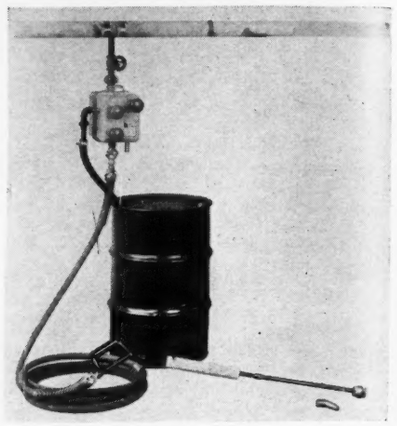
Hydrometer

"Permax" hydrometer is streamlined and easy to clean. Scale is of enameled lightweight metal and is fused into alloy weighting material. All parts will stand 300 deg. F. without discoloring or loosening. Scale is flat, with graduations and figures on both sides. It is said to be very easy to read. Taylor Instrument Cos., Rochester, N. Y.



Cleaning Machine

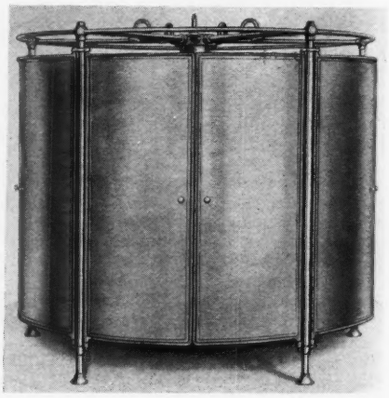
Kerrick Hydro Steam Cleaner produces an atomized vapor spray of hot water and soap at a uniformly safe temperature, with instantly variable pressure to suit the job in hand. Spray is said to be hot enough to clean dirty surfaces quickly, yet will not harm or burn fine finishes. It penetrates to inaccessible corners. There are no moving parts, and simple adjustment of three valves will deliver a cleaning spray varying from a solid stream of hot water to a finely atomized high-temperature cleaning spray. Operates on any steam line maintaining an open pressure of 60 lb. or more. Clayton Mfg. Co., Alhambra, Calif.



Chromium Primer

"Chroprime" is a clear primer which can be applied to chromium surfaces by spraying or dipping. After application, the primer is baked. It serves as a foundation for any kind of lacquer enamel, making it possible to finish chromium in any color. It is claimed it will resist heat and remain flexible. Maas & Waldstein Co., 420 Lexington Ave., New York.

Group Showers



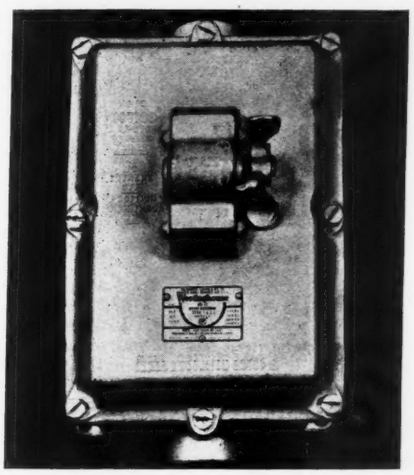
Group showers have twin doors for each compartment. Are similar to company's other group showers, but have added feature of increased privacy provided by the doors. "5-In-A-Group" model is circular with five compartments, "3-In-A-Group" model is semi-circular with three compartments. Only three plumbing connections are necessary, two supplies and one drain. Mixing chamber minimizes scalding hazard. There are no corners and dirt-collecting pockets, hence cleanliness is easily maintained. Constructed of frame-work of seamless steel tubing with doors and partitions of 16-gage sheet steel. Fixtures are finished in gray enamel. Bradley Washfountain Co., Milwaukee.

Unit Heater

Model VS unit heater is quiet operating, is designed especially for special applications where heated air is to be spread over large areas. Available in 28 sizes with four diffuser arrangements. Equipped with "Cradle Coil" feature which eliminates expansion and contraction strain on the heating element. The Trane Co., La Crosse, Wis.

Motor Starter

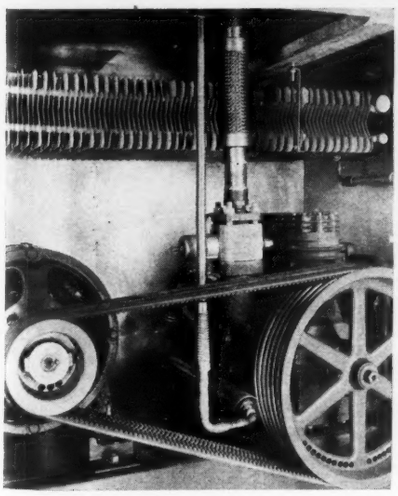
These explosion-proof manual motor starters are adapted for control and protection of single-phase and polyphase squirrel-cage motors where explosion-proof equipment is desired. Across-the-line type, they provide overload protection by use of a disk thermostat. They are front operating, have quick make and quick break toggle-type mechanism, corrosion-resisting finish on all metal parts. By changing

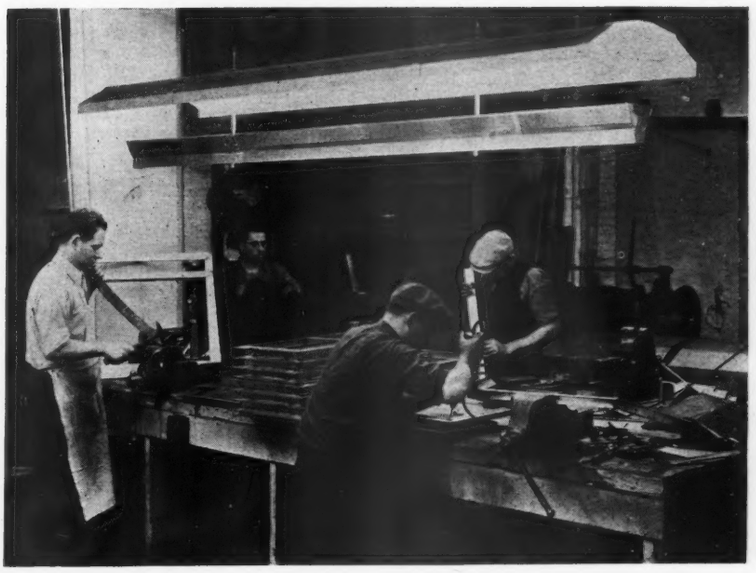


heaters, the starters can be changed from one rating to another. Overload control operates on time-lag principle. Westinghouse Electric & Mfg. Co., East Pittsburgh.

Vibration Absorber

Rex-Weld "Super Service" vibration absorbers are designed for use on compressor machinery in the connecting suction, discharge, and water lines. Made of a non-porous bronze alloy, these absorbers are





complete units quickly installed. Fittings are standard, attached by brazing, and will remain unaffected by any subsequent heat applied in "sweating" into copper tubing line. Chicago Metal Hose Corp., Maywood, Ill.

Cleaning Machine

No water or solvents are required with this No. 82 cleaning machine, in order to remove accumulations of grease, oil, and dirt from factory floors. The work is done by two wire brushes driven by a ¾-hp. motor at approximately 175 r.p.m. Motor

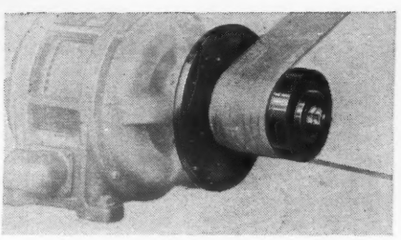
is mounted horizontally to obtain a low assembly that can be run under plant equipment. Motor connects to brushes through gearing arranged so brush rotation is inward at both sides. This results in no side pull, so that machine can be guided easily. Brushes are available in five standard sizes of steel wire. Each is refillable after tufts have worn down. Other brushes can also be obtained to adapt the machine for waxing or polishing work. There is also a smaller unit, No. 84. Its motor is rated ¼-hp., and brushes are driven at approximately 230 r.p.m. Finnell System, Inc., Elkhart, Ind.

Lighting Unit

"Light-Hood" is designed to give glareless, high-intensity lighting. Consists of aluminum lighting trough containing light sources on 30-in. centers. Troughs are 30 in. wide and 10 ft. long on standard sections. Other lengths can be had to meet specifications. Steel diffusing hook breaks up light and redirects it to the working level. Lamps used can be 100-, 150-, and 200-watt. Unit can be installed above any work bench, assembly line, inspection table, or other working area. Diffusing hood exterior is finished in gray lacquer enamel; interior reflecting surface is done in a white finish. Curtis Lighting, Inc., 1123 West Jackson Blvd., Chicago.

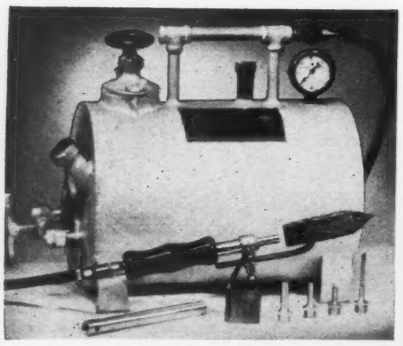
Clutch

Dickson Automatic Clutch consists of three principal parts: drive plate keyed to drive shaft; movable plate upon hub of which is keyed a pulley, sheave, or sprocket; actuating unit, floating on the shaft, with time-lag adjusting mechanism. Operates with equal efficiency on reversing motor. Processed cork friction member floats between fixed and movable clutch plates. Adjustable time-lag permits motor to attain full speed before load is applied. Sizes 1/20-350 hp. for speeds 600-3,600 r.p.m. Time-lag interval is adjustable downward from maximum which may be as much as 10 min. Dickson Automatic Clutch Co., 606 South Hill St., Los Angeles.



Soldering Outfit

The "Ace" portable gas generator gives an intense heat for soldering, brazing, melting, and heating purposes. It consists of generator, torch and iron, blow-pipe with



four different size tips, hose, lighter, and carbide. Manufacturer states that generator produces acetylene gas and will heat an iron in about two minutes. It can be recharged with carbide while in operation. Apparatus is automatic and regulation of the heat makes it possible to hold the iron to any desired temperature. By taking copper off handle, the torch may be used for melting or burning off solder or paint. Reiner & Campbell, Inc., 242 Lafayette St., New York.

Fuel Oil Meter

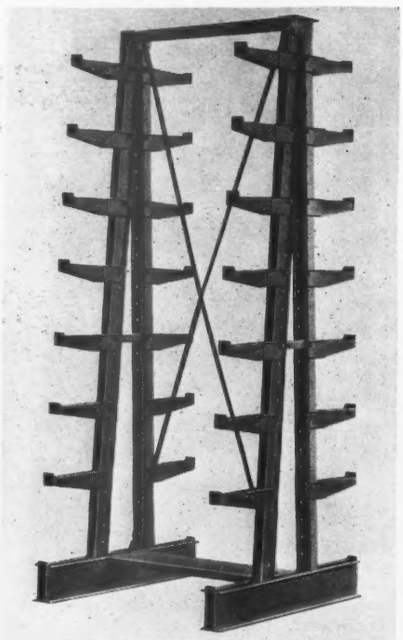
"Vesta" meter measures fuel to stationery diesel engines. It will measure from 1/10 to 14 gal. per hr., and will provide uniform flow to the engine within a tolerance of 4 cu.in. in 5 gal. It can be used for No. 1 to No. 4 fuel oil and with heavy oils if they are heated. It is installed between storage tanks and a day tank for gravity flow or between a pump and the day tank. Fluid Meters, Inc., Chrysler Bldg., New York.

Contactors and Linestarters

Midget contactors and linestarters comprise a line of remote-controlled, reversing and non-reversing magnetic starters for small single-phase and polyphase squirrel-cage induction motors. The operating mechanism is mounted on an insulating base and may be removed as a unit from the cabinet. Thermal overload relay provides protection. Can be operated from 2- and 3-wire thermostats, pyrometers, and other delicate instruments, as well as from pushbuttons and float switches. Non-reversing contactors are available for ½ hp., 110 volts, or 1 hp., 220 volts, single-pole or two-pole, single phase. The non-reversing starter can be operated either on 110 or 220 volts. Both reversing contactors and reversing linestarters are available in the following sizes: 1 hp., 110 volts, 3 phase; ½ hp., 110 volts, single phase; 1 hp., 220 volts, 3 phase; 1 hp., 220 volts, single phase. Westinghouse Electric & Mfg. Co., East Pittsburgh.

Pipe and Bar Rack

Pipe and bar rack of heavy construction consists of two upright assemblies made of posts, brackets, and base channels. Uprights are connected at top and bottom by formed channel plates and by diagonal stay braces. Brackets upon which pipes or bars rest are bolted to posts. Bases can be adjusted by 3-in. intervals. Each bracket will support a load of 2,000 lb., and each has clear depth of 12 in. General Fireproofing Co., Youngstown, Ohio.



Reflector

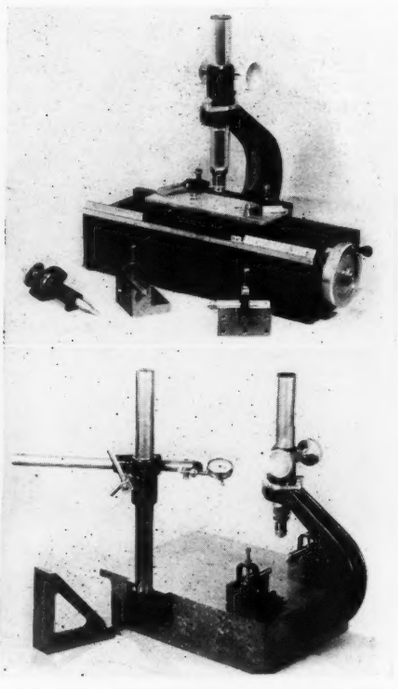
"Silvered Lamp" diffusing reflector has been developed for use with the silver-bowl-type lamp where it is desired to provide soft, even illumination with minimized direct and reflected glare. It has a deep overhanging skirt which shields clear portions of the lamp from vision. Opal glass section in neck permits small portion of the light to reach ceiling, to relieve contrast. Reflector is 20 in. in diameter, is of porcelain-enameled steel, white inside and out. Available in two sizes for 200- and 300-500-watt lamps. Benjamin Electric Mfg. Co., Des Plaines, Ill.

Welding Rod

"Aladdin Rod" makes a weld said to have strength as great as base metal when used for welding white-metal die castings. Reinforcing is not necessary in most cases. Aladdin Rod & Flux Mfg. Co., Grand Rapids, Mich.

Measuring Tool

The 20-cm. measuring engine and the three-angle surface plates are useful precision measuring devices for layout and testing work. The engine consists of bed—screw, nut, and associated parts—a simple carriage, reading microscope, and microscope mounting. Length of opaque objects 8 in. or less can be measured to an accuracy of 0.0001 in., and length of transparent objects of 4 in. in length or less. Accessories increase the versatility of the machine. The three-angle surface plate is 9 x 12 in. and 3 in. high. The three surfaces are scraped flat to 0.0001 in. and the three angles are 90 deg. within 0.00025 in. in a 12-in. length. The instrument consists essentially of dial indicator, microscope, and height gage. Mico Instrument Co., Cambridge, Mass.



"After seven years, the battery in our crane truck is still giving satisfactory service"

"We purchased an electric industrial crane truck in 1929 which was equipped with an Exide-Ironclad Battery.

"We have operated this truck continuously since that time and have experienced no repair expense or trouble with the battery. After seven years it is still giving us very satisfactory service."

SUCH reports are the soundest kind of evidence that you can depend on Exide-Ironclads for long life and consistently good performance. The high power ability and sustained voltage of these batteries enable them to handle the toughest jobs with ease throughout each shift. Write for free booklet, "In Selecting Any Motive Power Battery Be Sure."

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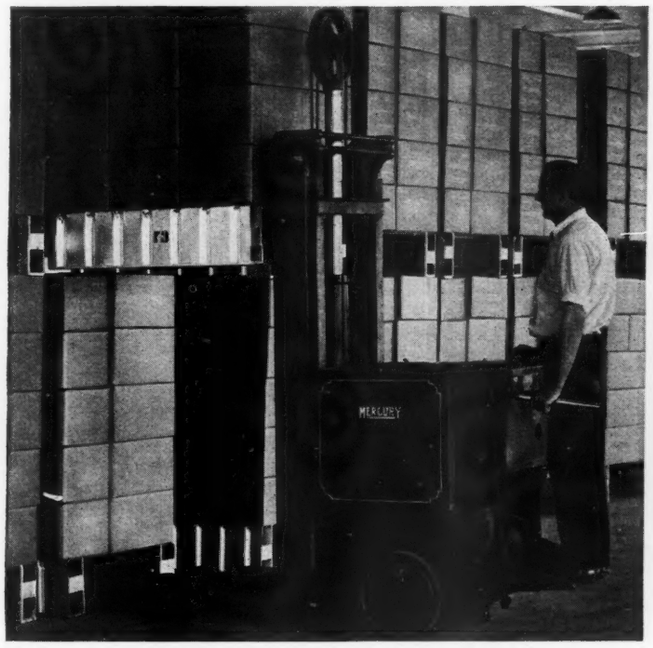


Truck illustrated made by Mercury Manufacturing Co.

A Contractor for Every Need

(*Continued from page* 67)

bination for industrial use consists of a contactor and one or more overload relays, forming an across-the-line starter. If desired, the unit may contain start and stop buttons, a built-in switch for selecting manual or automatic control, a circuit breaker or fuses for short-circuit protection, or a switch operated from the exterior for isolating the motor branch circuit.

Across-the-line single-phase motor starters rated 3 hp. or less at 220 volts are supplied with dual voltage coils containing two windings. These windings are connected in parallel for 110-volt operation and in series for 220 volts.

Proper maintenance of contactors is important. They should be inspected periodically. Contactors on severe duty or operating under adverse conditions should receive more than the usual attention.

Inspect, if possible, while the contactor is in operation. Make sure that contacts seal with adequate overtravel and give a sufficient gap or opening. Magnet faces of an a.c. magnet should close uniformly and intimately to prevent noise and coil failure. Bearings and sliding surfaces should be lubricated only when recommended by the manufacturer.

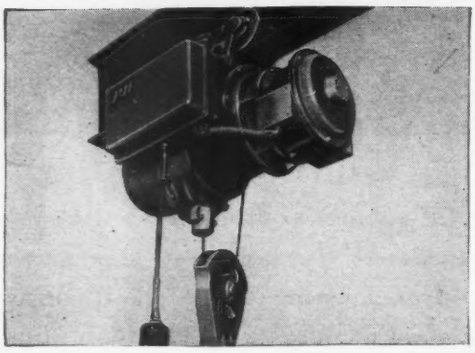
Silver contacts are in general use in small contactors and require little attention. Silver oxide, which forms on the contact surfaces, is a good electrical conductor, and to remove it would be wasteful. Copper contacts are usually employed on starters of higher ratings. Their pressure must be maintained and they must be kept clean and be replaced when worn excessively. They should not be lubricated, as the slight wear of dry contacts provides a self-cleaning action. When excessively rough or burned, dress with a fine file. Use of emery cloth is to be avoided, because it leaves abrasive granules embedded in the contact surfaces.

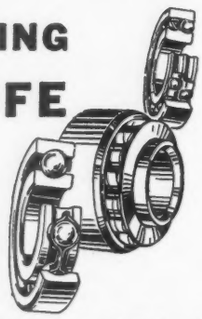
Low spring pressure is usually a result of contact wear; in this event, replacement of contacts will restore normal pressure. If it is due to failure of the springs, replace them.

While in operation, arc boxes or chutes must be kept firmly in place; otherwise, serious damage may result.

Overheating of the contactor coil indicates trouble, and requires immediate investigation. The coil voltage may be excessive, or some turns may have become short-circuited. With an a.c. coil, the trouble may be due to ill-fitting magnet faces or to too-frequent operation, since the coil current at open gap is many times that at closed gap.

Built with ANTI-FRICTION BEARINGS for SMOOTHER HANDLING —LONGER LIFE





In addition to ball bearing-equipped motors, all shafts, etc., in the P&H hoist mechanism ride on smooth-running ball and roller bearings—one of the big reasons for dependable operation and longer life.

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● No matter what your requirements may be, you'll find the right hoist in the P&H line to fit them. There's a complete range of capacities from 1/8 to 15 tons, with all types of mountings, operating speeds, lifting heights, etc. A P&H hoist engineer will gladly study your problems and recommend the size and type best suited.

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Headed for the Bowwows?

(*Continued from page* 44)

2. Politics is inextricably mixed with labor; we are living under a labor government, call it what you will.

3. Management, past the successive violent shocks occasioned by the C.I.O. bombshells, and having been given a chance to catch its breath, is to a great extent taking a hand in the game and is playing the cards it has been dealt to the best of its ability.

4. Labor, still under pretty good

control, is getting some wise counsel and is listening. It is getting some bad advice in spots, too, and many a union neophyte will be disillusioned to find that his voice is small if heard at all in the group meetings, that his dues must be paid, and that he takes orders from above. He's "in the army now." He may have been told that "there will be one wage for all," but that's not true. And after the fun is over the job is still tough, rent is still high, prices seem to go up.

The real labor capitol is Washington. Everyone is labor-minded there, and the big central headquarters of C.I.O., A.F. of L., and the government itself buzz with activity. Incidentally, the visitor to C.I.O. offices, in Washington or elsewhere, invariably is treated with respect and courtesy. Perhaps he is in favor of the open shop; he's welcome anyhow.

Many Stock Arguments

Talking to the average man, who may or may not be a union prospect, brings up certain prevalent catchwords and phrases in any city these days. Some of them are doing more harm than good; most of them will fade under the light of even rudimentary examination. Here are a few of them, picked at random from stock arguments used on both sides, together with the right answers:

"These union organizers are outside agitators." Certainly they are, in most cases. They're experts. Management also uses outside help whenever it needs to. Sometimes it is owned and controlled elsewhere. And it always has called in expert assistance in special fields.

"Employers' greed is responsible for all this." That is not the whole story, even if true in some places. Most employers are as greedy as the average workingman, no more, no less. Self-advancement is a thing employers desire. They wanted the same thing when they worked in the shop, and they're working now to get a step higher. That's American business life. And labor carries the same flag.

"The Reds are responsible. Russia is behind this." Nope, not by the look of the boys who are putting on the show, nor by the feeling of the average citizen. It just won't wash. Lets start back in 1929, and . . . .

"John L. Lewis wants to be president." Probably. Nearly every male, white American has dallied with the thought. Mr. Lewis will have to be elected first.

"We are plunging into fascism. Or communism." Whatever we are plunging into, America as a whole is still here, has its eyes open, is confident and fairly happy. There are more Americans than there are Democrats, Republicans, C.I.O.'ers, or New Dealers. America still has a hold of things.

Those are the reactions, boiled down. Winnow them out, and you'll find a lot of folks badly scared, a lot indifferent, a lot hoping to chisel some extra advantage for themselves. But the majority, take it in management, labor, government, or any place, is getting down to work on these problems and is optimistic of the future.

Profit Sharing Is Probably Not the Thing

(*Continued from page* 52)

be readily justified as sound for the employee, the employer, and the public.

The payment of wage bonuses contingent on profits is at best an unsettling procedure. Such arrangements do not lend themselves to joint agreements in which wage scales are

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fixed through collective bargaining for a period of time. Expectations are aroused which, when fulfilled, may bring the accounting procedures and the good faith of the employer into question, since few workers—or supervisors, for that matter—can weigh precisely all the factors that affect current profits. Wage levels set as broad plateaus, rising and falling moderately with the moving average of business proceeds, are much more conducive to responsible collective bargaining based on an intelligent understanding on the part of rank and file employees, their representatives, and the general public.

The use of the salary basis of payment, as far as is possible, introduces an element of certainty in compensation which most managerial and clerical workers have long come to take for granted. Although many companies pay regular wages to certain shop employees—or, less frequently, set weekly guarantees—the uncertainty of pay by the hour or by the piece is generally reserved for those in the economic scale who can least afford uncertainty. Justification for such fluctuating payments is based on the need for incentives and to permit precise measurement of costs. With improved planning and supervision, these arguments have lost some of their force. Meanwhile, a greater appreciation of the needs and attitudes of the wage earner and of the close interrelations of security and incentive have led many employers to question the "scientific" nature of complex compensation schemes. Apart from the over-all advantage of more stable incomes to workers, the growing dissatisfaction of workers and managements with such compensation methods will probably encourage the extension of the weekly or monthly salary principle. As a byproduct of this movement will come a greater sense of status in the mind of the employee and more foresighted planning on the part of management to respect that status.

A ground-swell movement to which the depression gave great impetus is that demanding protection in old age. The Social Security Act affords but a partial answer to this demand. Private retirement systems must be continued and extended if adequate security is afforded to older and better-paid industrial employees. Public pensions will not remove the necessity, as a matter of sound personnel practice, of assuring annuities sufficient to permit the retirement of superannuated employees of all ranks.

But pension schemes involve large expenditures. The rising level of profits should permit many corporations to establish or augment pension reserves. Through payments to insurance carriers or into trusteed funds, such reserves are taken out of corporate surplus for the use of those who have made the surplus possible. To expect the individual worker to save scattered and varying bonuses to meet his needs in old age is both unrealistic and uneconomic. Group annuity arrangements avoid the losses and uncertainties of piecemeal savings programs. With the growth of the practice of vesting annuities in the individual employee, the objection that workers are tied to a single employer is being increasingly met.

Finally, among many other methods of assuring maintenance of wage-earner incomes is the establishment of trusteed savings or reserve funds for the protection of employees and their families against sickness, disability, and unemployment. Such programs are frequently financed currently by joint contributions and can be made voluntary or based on a general, collective agreement. But a time of good business offers an

LOW COSTS
SUSTAIN PROFITS—WAGES—EMPLOYMENT

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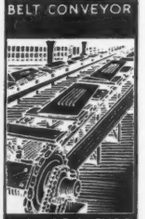
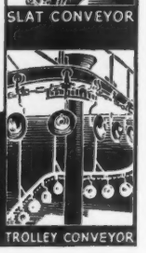

SLAT CONVEYOR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● Paradoxical though it seems, it is becoming clear that only low costs, obtained by great efficiency, can sustain high wages, profits, and employment. All evidence points to it. Reason demands it, because only low cost manufacture . . . giving the buyer much for his dollar . . . can win the markets which build business. • Jervis B. Webb Company provides low cost in material handling. Makers of a wide variety of conveyors . . . skilled in engineering them . . . we have an exceptional record of savings produced. • No matter what you handle . . . in production . . . storage . . . or shipping . . . let Jervis B. Webb Company show you the savings to be made.

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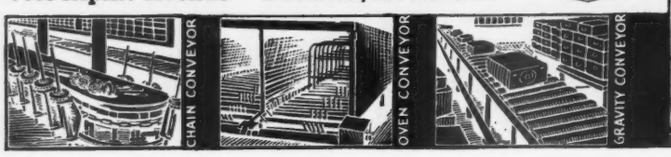
CHAIN CONVEYOR
OVEN CONVEYOR
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opportunity for the employer to buttress these reserves in order to meet the increasing incidence of sickness and disability that occurs among older employees, to provide for dismissal compensation or unemployment benefits supplementing those under state plans, and in general to expand the scope of all security benefits.

Essentially such appropriations to savings or benefit funds are a form of deferred wages. It can be argued that the worker should receive every cent available for wages without strings attached. Yet considerable amounts of money will be appropriated to such funds that will never find their way into current wages. An employer has a stake in the security of his employees and in the community in which he does business. When wage levels have been raised as much as sound policy permits, it seems better to appropriate such additional funds as are temporarily available to some type of security program rather than to a hit-or-miss profit sharing scheme. With joint contributions and joint administration, such benefit arrangements will be far less paternalistic in spirit than sporadic hand-outs of cash at times when the board of directors is in a generous mood or when "loyalty" is urgently wanted. Through employee contributions to such cooperative plans, equities are developed upon which the individual can depend against the rainy day.

These and other policies seem to be called for if American employers are to assume a position of industrial statesmanship in lessening the evil of recurrent booms and depressions. After the first flurry of opposition to governmental interference, most foresighted employers are coming around to a position of acceptance in principle, at least, of the necessity of social insurance. With the government and labor lending their weight to the movement toward wage-earner security, it would be a tragic mistake for industry again to initiate the roller-coaster policy of wages.

•

Who Gets the Security?

Approximately 50 per cent of the total working population of the United States is not covered by old-age benefit provisions of the Social Security Act, according to the National Industrial Conference Board.

Gainfully occupied persons not covered by the Act include (1) those in excluded occupations, among which the more important are agriculture, public service, and domestic service in private homes; (2) persons in business for themselves, principally in trade and the professions; and (3) persons over 65 years of age. Approximately 2,300,000 workers in transportation are also excluded from the Social Security old-age privisions, but of these about 75 per cent are covered by the Railroad Retirement Act of 1935.

The industrial group in which the largest percentage of workers, 95.8 per cent, is covered by the old-age benefit provisions is made up of mining and forestry. This is followed by the manufacturing and mechanical industries group in which slightly over 90 per cent of the workers are covered, and by trade with a coverage of approximately 63 per cent.

Goodrich Shows Employees Where Earnings Go

To tell employees the story of its 1936 operations, The B. F. Goodrich Company showed in the *Circle*, the employees' paper, a pie chart graphically illustrating how each penny of the sales dollar was used.

Materials and supplies took 45 cents. The next largest amount went for wages and salaries—32 cents. Taxes required 7 cents, 3 were retained in the business. Dividends and interest each received 2 cents, and the remaining 9 cents went for all other manufacturing, distribution, and miscellaneous expense.

NO skidding from side to side, quick stops and sure starts—the same features which make Inland 4-Way Floor Plate safer underfoot make it also safer under plant haulage equipment. It is equally slip-proof in all directions.

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Sayings and Doings

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Public Relations

Relations between the public (meaning all the people) and business (as a whole and as individual concerns) have taken on an importance which demands universal recognition by top management. The public is in a resentful mood. Politicians of all colors are ready to manipulate this feeling for vote production, and a crackpot fringe is biding its time again to drum up the fuzzy-wuzzies.

In a review of the situation by *Business Week*, the following points were presented:

1. Public relations work ought not to be confused with publicity. Properly speaking, publicity involves promotion of company products or officials and can be handled by advertising and sales departments; public relations involve the mental attitude of humanity in general toward the company.

2. Public relations work should be handled by an official with authority in his own right, possessing a high title, close to the real head of the company.

3. The public relations executive should be in the complete confidence of management, knowing the entire background of every situation he is called on to handle.

4. Since the complexities of big-company management often remove the head executive from the general public, it becomes the job of the public relations official to interpret to the head man what the mass of people think of the concern as well as to interpret his company to the public.

5. Lawyers are generally inept in public relations work because of professional limitations. They should be consulted, preferably, for "yes" and "no" answers to legal questions.

6. "Lobbying" doesn't belong with public relations. Legislative work should be handled by specialists in this field.

7. Public relations activities should be strictly on the level. The risk of a kick-back is dangerous. Ask the companies or industries that have been caught "trying to slip something over."

8. In small companies, the active head of the business should handle his own public relations. If he lacks experience or aptitude, he can consult specialists.

9. Drives for cooperative public relations work through business organizations should be pressed by the membership.

10. The public reaction is involved in treatment of employees because they talk and the people read of labor troubles; in every employee contact with the public; in mail or phone technique; in promotional activities; in pricing policies; in the very appearance of buildings and equipment.

11. Simplified, the problem is one of producing good-will activities, conditions conducive to social well being, then actively and consistently merchandising them.

It is up to business, through organizations and separate concerns, to prove that it deserves public good will. Great corporations can solve and are solving the problem by engaging public relations specialists and giving them high ranking offices. They usually are vice-presidents or assistants to the company's head. Concerns of all sizes can get help from national, trade, and local associations. They can call to their aid competent public relations counsel.

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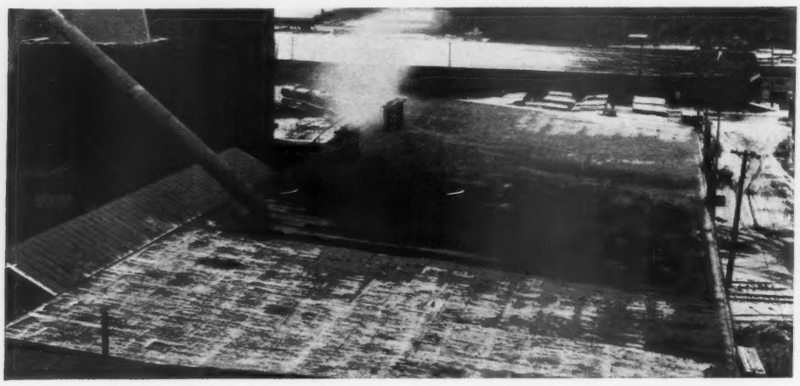
How Bell Telephone Promotes Good Will

Bell Telephone System drills all employees in avoiding irritation to the public and actively promoting good will. Contact work is left to operating companies so that appropriate methods may be applied to different territories. There are public relations in the pre-



FORGOTTEN . . . SINCE 1926

Eleven years ago the White Sewing Machine Co. of Cleveland, Ohio, erected a two-story building in which to kiln-dry, cut and assemble the hardwood of its cabinets. The specter of possible water-damage to expensive wood stock, made them demand a roof of unquestioned quality and durability, and after thorough investigation, 16,000 sq. ft. of Fenestra Holorib Steel Roof Deck, topped by insulation and water-proofing, were laid.

From that day to this, the roof has been forgotten. Not a drop of water . . . either from leakage or condensation! Not a dollar for repairs or maintenance!

The United States is dotted with forgotten roofs, like this one . . . for Fenestra Holorib Steel Deck properly insulated and protected is an automatic farewell to future roofing troubles.

Although unusually light in weight, Holorib's triangular rib construction provides exceptional rigidity. It can be laid with speed and ease and may be either clipped or welded directly to the purlins. Often, it reduces structural steel costs thus providing a saving in initial expense.

Return coupon for details, or send sketch for a definite quotation.

Name _____

Address _____

City _____ State _____

DETROIT STEEL PRODUCTS CO., 2258 E. GRAND BOULEVARD, DETROIT, MICH.

Fenestra HOLORIB

ROOF DECKS FLOOR FORMS

INTERNATIONAL Tractors Speed-Up Work and Save Money in This Plant

This is the International Model I-12 Industrial Tractor hauling 20,000 pounds of scrap rubber in the yards of the Midwest Rubber Reclaiming Co., East St. Louis.

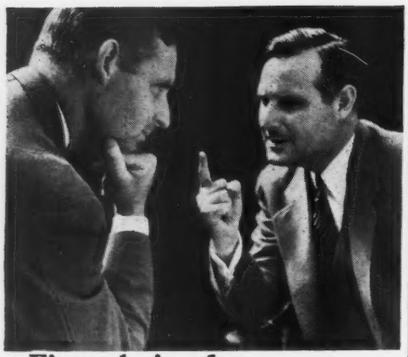
Two International Industrial Tractors —a Model I-12 and a Model I-30 equipped with crane—are proving a highly profitable investment for the Midwest Rubber Reclaiming Co., East St. Louis. Their principal job is handling scrap rubber. The Model I-30 unloads the bales of rubber from cars and piles them on trucks which the smaller Model I-12 hauls to the storage yard. There they are unloaded from the trucks and put in piles by the Model I-30. When the rubber is needed in the plant, they move it in the quickest possible time.

Even though these Internationals are handling more material per day than could two tractors formerly used, their fuel consumption and upkeep are less. They have eliminated delays and have effected savings in demurrage.

Investigate International Industrial Tractors for your materials-handling work. The nearby Company-owned branch, or industrial dealer, will give you complete information.

INTERNATIONAL HARVESTER COMPANY
(Incorporated)
606 So. Michigan Ave. Chicago, Illinois

INTERNATIONAL HARVESTER



First choice for economy say industrial users

Interfold tissue—the type originated by Onliwon in 1906 is the first choice for economy with 78% of its users among more than 100 factories checked in a recent impartial survey. Not only does the Onliwon dispensing cabinet contribute to the economy of this famous Onliwon Tissue, but it effectively safeguards the cleanliness and purity of its contents up to the actual moment of use. Phone your local Onliwon representative today and learn at first hand the advantages of this high quality tissue that has proved so economical in thousands of installations. Or, write for samples to: A.P.W. Paper Company, Albany, N. Y.

A.P.W.

Onliwon Tissue

A Constant Reminder

A useful note book with dated pages, mailed every month to a selected list of customers or sales representatives, will be kept and used daily, constantly impressing your name and message.

Not an advertising "novelty"—but a tested plan which has a remarkable record of results accomplished for those using it.

Vest pocket size. A dated page for every day, with an interesting quotation and space for notes. Cover and fly leaves provide eight pages for your advertising, changed monthly as desired. Offers the advantages of a house organ, with the added value of usefulness. Inexpensive, even in small quantities. Exclusive rights arranged.

Write for samples and complete details

NORMAN DUBLE

Publisher

192 Lexington Avenue, New York

determined tones of the operators' voices. Installers must be considerate of subscribers' floors and walls; linemen must seek the friendship of property owners; office employees must be as solicitous of customers' feelings as of the company's rights. Workers are kept informed as to what goes on within the company so that they can intelligently discuss its affairs and correct false statements.

New York headquarters of the Bell System acts as a clearing house for ideas. Few news releases are used. Stockholders (about 700,000 of them) are kept informed by regular financial reports which are stand-outs for clarity. Operating companies handle newspaper advertising, but headquarters supervises magazine placements. Copy is mainly institutional, giving the reader as many public relations impressions as can be readily absorbed.

Advertising for the entire system costs around $4,000,000 annually. Copy appears in all sorts of media, has back of it the momentum of a consistent policy followed for 20 years. And behind all this is one of the most perfectly organized public relations setups in industry, operating under the responsible authority of a vice-president, basic in the company's structure. An incidental result—political persecutors who have crucified other concerns have found this corporation's position with the public impregnable.

•

Harmony Campaign

The current epidemic of strikes emphasizes the importance of cooperative civic efforts for industrial peace. One of these is the "harmony campaign" which has been used in such cities as Youngstown, and Canton, Ohio, Johnstown, Pa., Lawrence, Mass., Dubuque, Ia., Grand Rapids, Mich., Kenosha, Wis., Chicago Heights, Ill. Its main feature is 13 full-page newspaper advertisements sponsored by social and civic organizations in the cities where they appear. The campaign is supplemented by editorials and articles localized wherever possible. Contests are held for the best article on "What industrial harmony means to ——— (name of the city)." The program emphasizes the harm done to entire communities by labor disruptions and the value to all of peaceful settlements.

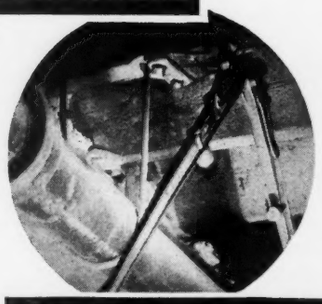
•

Still Safe—at Forty!

The personnel manager, safety engineer, or "efficiency expert" who attempts to improve the safety or production record of an industrial establishment by recommending the removal from its labor personnel of those who have arrived at an arbitrarily fixed "old age" may defeat the very purpose for which he is engaged.

Many reports are received today that industry does not want to employ a man over 40 years of age. Veterans of the

EVERYWHERE



AROUND THE PLANT

PORTER CUTTERS

Promote Efficient Maintenance

Wherever maintenance, repair or routine operations require cutting of bolts, wires, rods, rivets, wire rope, chain — or removal of deformed or "frozen" nuts — Porter Cutters are whole minutes *faster*, and a great deal *easier*, than any other way of cutting with portable tools.

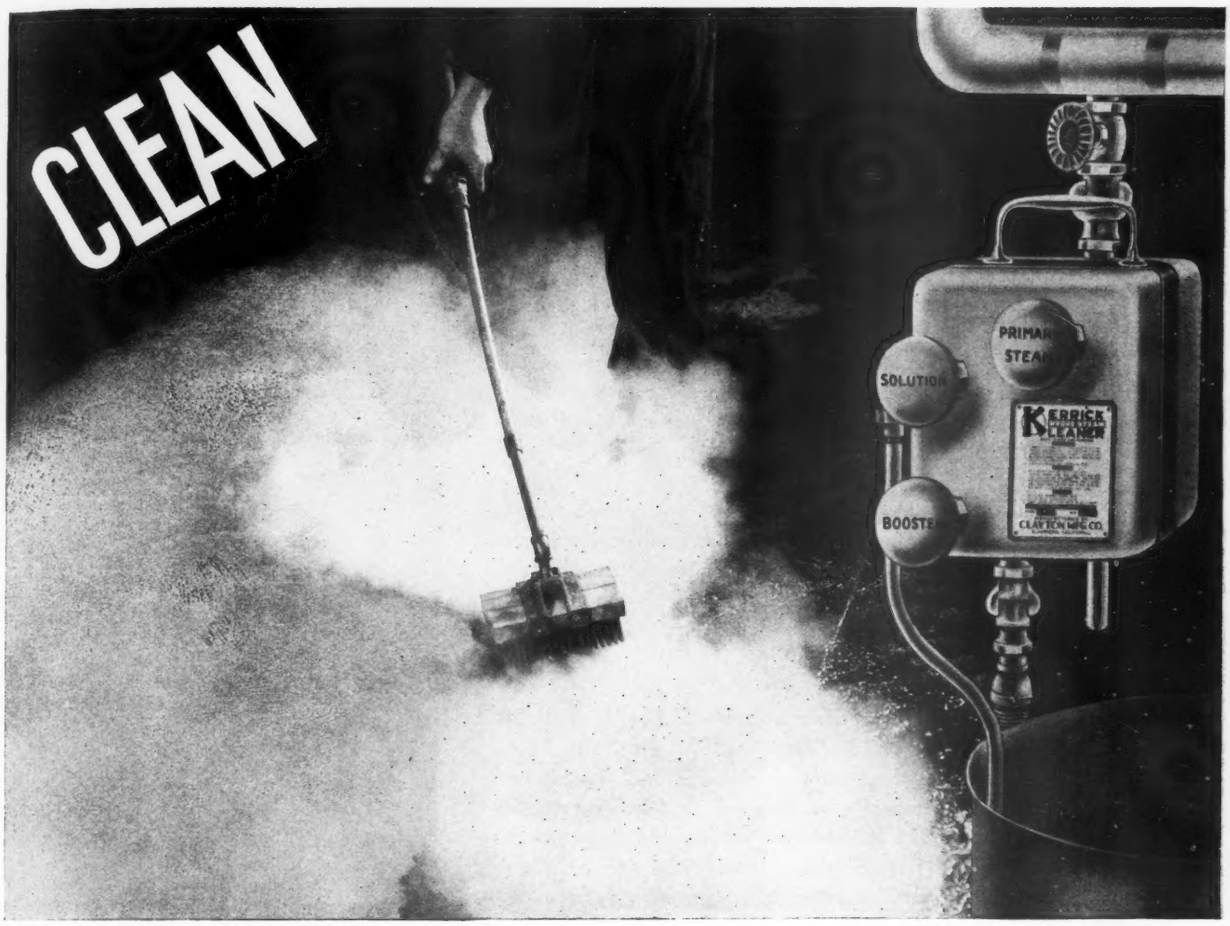
Your own experience will suggest dozens of uses in every-day or emergency work. And remember — there is a Porter Tool for every cutting requirement up to ¾" stock; for hardened chain up to ½".

Ask your supply house about Porter Cutters, or write us for descriptive literature.

THE PORTER SWIVEL HEAD

Furnished as optional equipment—broadens the usefulness of Porter Cutters. Swing 90° to either side—reaches around obstructions — cuts with full power in all positions.

H. K. PORTER, Inc.
EVERETT, MASS.



Revolutionary HOT VAPOR CLEANING

At last... steam is harnessed as a cleaning force. The KERRICK *HYDRO-STEAM* KLEANER utilizes steam to produce a hot spray of properly proportioned compounds. Solution mixture, heat and pressure are regulated by three valves to apply the proper cleaning solution to every type of cleaning job. The *HYDRO-STEAM* is simple, compact and readily portable. It requires no connections except attaching to any steam line maintaining an open pressure of 60 pounds or more. *HYDRO-STEAM* cuts time and labor in thoroughly cleaning all kinds of machinery and parts; floors, walls, windows, automotive equipment . . . anything, any place where steam pressure is available. Mail the coupon today for free demonstration at your plant.

KERRICK
HYDRO-STEAM
KLEANER

CLAYTON MANUFACTURING CO. F-5
Alhambra, California.

Have your nearest distributor arrange with us for a demonstration of the Kerrick HYDRO-STEAM Kleaner at the address below.

Name.....

Firm.....

Address.....

City..... State.....

YOU CAN SAVE

on First Cost—Installation, Operating and Maintenance Expense as well as Space

GOULDS "Close-Cupld" Centrifugal Pumps can show you real savings in your pumping costs—savings that will be reflected in lower costs of your product.

These compact, all purpose, efficient pumps are available in standard construction for handling ordinary liquids and in special materials for corrosive and other "hard to handle" liquids.

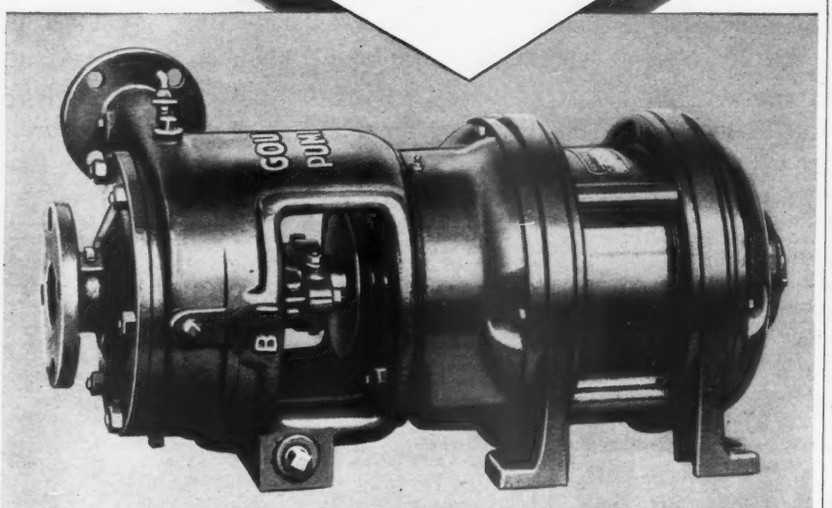
Installation is simple for they will operate in any position; operating costs low, for these pumps are highly efficient. Maintenance expense is negligible, for substantial design, careful workmanship together with the finest of materials insure long life and freedom from shutdowns for repairs.

No matter how exacting your requirements may be, there is a GOULDS "Close-Cupld" Centrifugal Pump ready to do your pump job efficiently. Twenty-one sizes with a capacity range of 5 to 1600 G.P.M. for heads up to 525 ft. Standard and special constructions and many types of motors. Here is a line of pumps on which you will want to have complete data.

Write for bulletin No. 208.

GOULDS PUMPS Inc.

ATLANTA, BOSTON, CHICAGO, HOUSTON, NEW YORK, PHILADELPHIA, PITTSBURGH, TULSA. Representatives in all Principal Cities



Goulds Figure No. 3620 Close-Cupld Centrifugal Pump for general service pumping. Compact, low-cost, highly efficient. Complete unit can be operated in any position.

7337

World War, who now average over that age, and applicants for work on relief projects are among the most emphatic in this statement. The charge is laid at the door of safety engineers, efficiency experts, and personnel directors that they discourage both the hiring and retaining of workers after they have reached 40.

No doubt there are some occupations which are properly termed "young men's jobs," such as those requiring strenuous physical activity. Yet many a man in his forties or fifties, or even the sixties, can and does meet the physical requirements of these jobs. Moreover, his experience and skill make him safer, more efficient, and more valuable than his younger fellows.

While figures showing the proportion of number injured to the number employed and the man-hours worked and lost in certain age categories are not recorded, the workmen's compensation reports of the State Department of Labor do show that in the compensated cases of 1933, 1934, and 1935 in New York State, 60.4 per cent of the injured workers were 39 years of age or under and 39.6 per cent were over that age. Without man-hours for each classification it is impossible accurately to compare the safety marks for the two groups, but on the face of U. S. Department of Commerce figures for 1930, there appears to be no distinct statistical advantage for the younger workers. According to federal figures, 61.7 per cent of the gainfully occupied in New York State were 39 years of age or under and 38.3 per cent were older. Thus it might be that 61.7 per cent of the workers had 60.7 per cent of the accidents, and 38.3 per cent of the workers had 39.6 per cent of the accidents.

On WPA projects, however, the authorities report older workers in much greater proportion than in private industry. I am advised that safety directors and supervisors there have observed that the older workers are charged with materially less lost-time accidents than are the younger, and that the so-called "old age ailments" such as hernia and cardiac afflictions are involved in these accidents to a "surprisingly" low degree.

It is certainly false economy and efficiency to speed up production through the intensive physical effort of young workers only to run into a complete shutdown or breakdown of the production system due to an accident caused by inexperienced or youthful carelessness. But even could the younger worker be made 100 per cent safe, there can be no skimming the cream of working years without far-reaching and disastrous economic effects.— *Elmer F. Andrews, Industrial Commissioner, State of New York*

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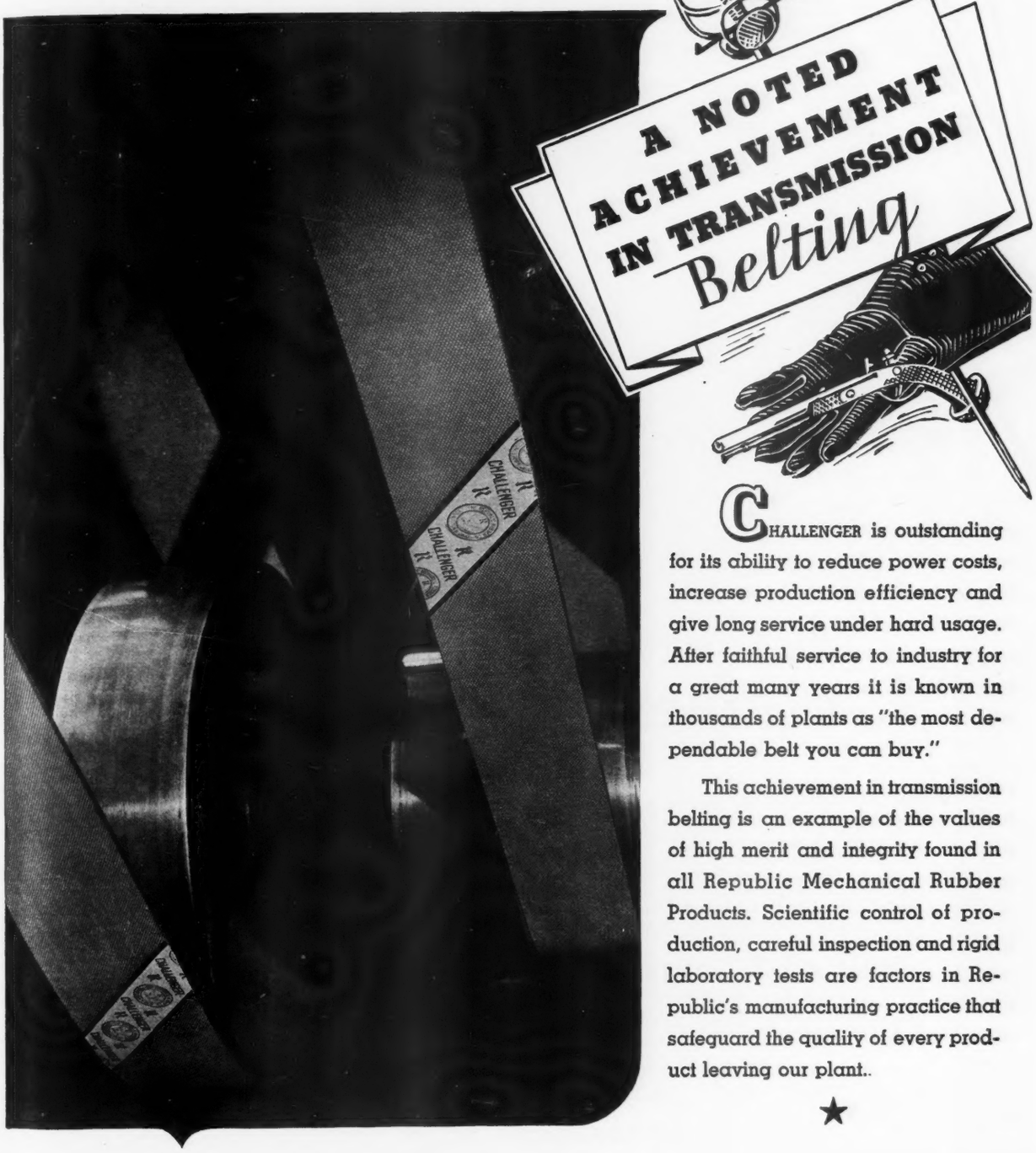
"Eyes for Industry"

A new film, "Eyes in Industry," has been prepared by the Better Vision Institute in connection with its pro-

★ ★ ★ CHALLENGER



CHALLENGER is outstanding for its ability to reduce power costs, increase production efficiency and give long service under hard usage. After faithful service to industry for a great many years it is known in thousands of plants as "the most dependable belt you can buy."

This achievement in transmission belting is an example of the values of high merit and integrity found in all Republic Mechanical Rubber Products. Scientific control of production, careful inspection and rigid laboratory tests are factors in Republic's manufacturing practice that safeguard the quality of every product leaving our plant..

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The REPUBLIC RUBBER Company
YOUNGSTOWN • OHIO

Manufacturers of HOSE
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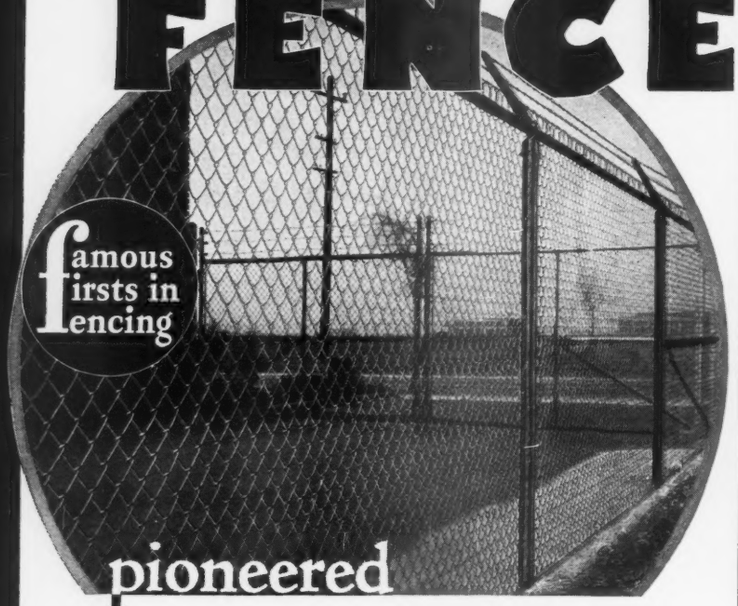
MOLDED PRODUCTS

ORDER REPUBLIC RUBBER PRODUCTS FROM YOUR DISTRIBUTOR

PAGE FENCE

famous firsts in fencing



pioneered *and* perfected STAINLESS STEEL* fencing . . .

Allegheny METAL

For 54 years PAGE has been identified with the most famous firsts in fencing. America's first woven wire fence was made by PAGE in 1883.

With no manufacturing obligation to any one metal, PAGE is the only fence consistently associated with the greatest names in metals. Page-Allegheny Stainless Steel fencing was pioneered and perfected to provide immunity to rust without protective coating, tensile strength four times that of low carbon steel, long life and sheer beauty. It is possible to use lighter gauge Stainless Steel wire to secure strength equal to much heavier fences.

*ONE OF 5 SUPERIOR FENCE METALS

PAGE FENCE is offered in 5 superior metals to meet every condition in fencing—Page P-12 Copper-bearing Steel, Page Armco Ingot Iron, Page-Alcoa Aluminum, Page-Allegheny Stainless Steel and Page genuine Wrought Iron. All Page P-12 galvanized fence—mesh, fittings, top rail and new P-12 Wing Channel Line Post—is covered by the 12-dip Preece Test guarantee, the highest known to the industry.

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AMERICA'S FIRST WIRE FENCE—SINCE 1883

gram of improving industrial seeing conditions. It is designed to meet the need for a convincing presentation on eyesight to employees and employers. It is estimated that the money cost alone of defective vision in industry is $50,000,000 a year. In the distribution of this film, the Institute will have the cooperation of the National Association of Manufacturers, the Aetna Insurance Company, and the National Safety Council.

•

30 Hours by Degrees Not by Decrees

[*From the Barcalo Workshop Bulletin, published by the Barcalo Manufacturing Company, Buffalo—and presented here as an excellent example of how one concern is disseminating simple economic facts.*—EDITOR]

Much has been said and much written about the 30-hour week. It may come some day, but if it comes or if anything short of the 40-hour business week comes, *let it come as the shorter hours have come over the years.* As someone has said, "Let it come by degrees and not by decrees." In 1899 those employed in factories worked on an average of about 58 hours per week. In 1929 the average was 48 hours per week, and now but few operate in excess of 40 hours. It is estimated that since 1899 wage rates are up approximately 200 per cent and we are all better off than we were in 1899, and we want to do still better.

The change for the better which has taken place over the years is not the result of legislation, and it didn't come overnight. The introduction of machinery had something to do with the change and so did refinements in methods and if anything less than the 40-hour week does come, let us hope that it will come gradually so that sales will not be interfered with, for it is through sales and orders that employment results, and if increased cost to the consumer takes place, it will mean less of buying. It is just plain common sense that the more an article costs, the less the chance for its sale.

Let's use a few figures and see what the result is, but before we apply these figures to some article that we produce, let's think back. What we know as steel comes out of the ground in the form of ore. It probably is not possible for a group of men to take as much ore out of the ground in 30 hours as they do now in 40 hours. And so it goes, in loading the ore on the boats and taking it off the boats and putting it through the various operations until it comes to us in the form of steel, ready for use. Mind you, if there is a boost in the labor cost of one-third in any one of these operations, there is the same relative boost in all of them, and you know what compounding means.

Now take a tool and assume that in 40 hours a man turns out 300 pieces and receives $30. This makes the di-

This NEW-TYPE *paint makes light* *FULLY EFFECTIVE!*

● Luminall paint makes natural and artificial light fully effective and gives your employees the unhindered vision that is needed for swift, accurate work.

Luminall is a new-type paint using colorless casein as the vehicle for its super-white lithopone pigment. It is an amazing paint in its lighting efficiency. With your same wattage it gives factories far better illumination—floods the room with glareless light.

The mechanical and optical principles of Luminall are fully explained in a free book you should read—"Painting For Light and Decoration." Send for it.

Luminall will not yellow from age . . . it is not affected by many acids and their fumes . . . one coat will cover the blackest walls and ceilings . . . dries in 40 minutes . . . very economical . . . easy to apply with brush or spray on any interior.

All kinds of manufacturing plants are using Luminall with grand results — lower painting costs and, best of all, producing higher returns from their payrolls.

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HOME OFFICE: 3617 So. Wall Street, Chicago
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Manufactured in Canada by Standard Paint & Varnish Co., Ltd., Windsor, Ont.

LUMINALL *for Factory Interiors*

NATIONAL CHEMICAL & MFG. CO., (Not Inc.)
3617 S. Wall Street, Chicago
Please send booklet on Luminall and advise how we can test this paint free of cost in our own plant.

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Title.....
Name Firm.....
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The
LUBRIPLATE FILM
Published In the interest of better lubrication

"It's the Film"

Performance and Life of Ball and Roller Bearings are Greatly Influenced by Lubrication

Under date of March 22, 1937 the Breuer Electric Mfg. Co., of Chicago writes:

"You will be interested to know the success which we have had with LUBRIPLATE No. 210 on lubrication of Norma-Hoffman ball bearings used in our TORNADO VACUUM CLEANERS and TORNADO PORTABLE ELECTRIC BLOWERS. Previous to using LUBRIPLATE we used a number of other greases and in time this grease would get away from the ball bearings and in such cases would permit them to run dry. Since using LUBRIPLATE, which we started in 1933, we have eliminated this trouble. We can highly recommend LUBRIPLATE for use on ball bearings."

In addition to its superior lubricating properties and long life, LUBRIPLATE reacts with metal and forms a protective film on contacting surfaces — thereby reducing wear and *eliminating corrosion*. Smooth, quiet operation and long bearing life is assured.

Investigate LUBRIPLATE today.

LUBRIPLATE DIVISION
FISKE BROTHERS REFINING CO.
Established 1870
129 LOCKWOOD ST. NEWARK, N. J.
Plants: NEWARK, N. J. and TOLEDO, OHIO

rect labor cost of the article produced 10c. Now suppose that we are obliged to change over tomorrow to 30 hours and that the operator receives the same $30. In the 30-hour period he can, of course, turn out only three-fourths of the 300 pieces or 225 pieces, making the labor cost of each 13 1/3c and this, of course, has only to do with the direct labor. Almost as much is spent for indirect labor or burden, as we call it.

Now it is not to be inferred that because one of these operations carries a labor increase of one-third that the retail price of all articles will jump a full one-third. They will not, for such items as rent, taxes, advertising, interest, etc., will not necessarily increase, but there will be a very material increase, and the effect on the consumer's pocketbook might be illustrated in this way:

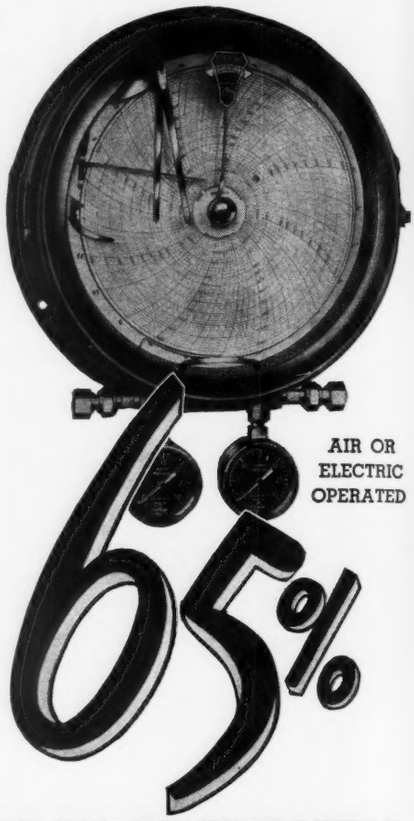
Suppose the operator above referred to had saved $25 with which to buy one of our mattresses. When he reaches the store, he finds that the price has jumped to $30. There is one of several things he can do. He can postpone the purchase which deprives one of our workers of labor and his wages. He can buy a cheaper one which will not last as long or be as comfortable, and because cheaper, there is less of labor and wages involved in replacing the item in the store. He can go in debt to the extent of $5 and until that debt is paid, he deprives someone else of the wages involved in the expenditure of $5 for something else.

There is no question but that the change from 40 to 30 hours would still further urge the introduction of labor-saving machinery. This would practically be forced on industry. Sometimes the bringing into a plant of more labor-saving equipment results in the loss of jobs, but in the end it brings greater employment because lowered costs bring lower selling prices, more orders, and more employment.

When under NRA the change was made from 48 or 50 hours to 40 hours, it was expected that employment would increase 20 or 25 per cent, but it just didn't. Because of the increase in cost due to the change in hours, industry has pulled through with as few additions as possible, and employment statistics show that there was no such increase as planned.

It is desirable to have a goal and that goal a reduction in the cost of things, and through this reduction an increased wage rate so that the average person will have more with which to buy, and can buy more because the money will go so much further. This is the plan advocated by economists and by other thoughtful persons. Forget the 30-hour week, but gradually lessen the hours through lowering costs by joint effort. Let the change come about as resulting conditions warrant and just as industry has gone from 60 hours to 40 hours, with everyone better off than in the early days. To do this we must work together.

Since preparing the above, the Brookings Institution, independent and



OF ALL TEMPERATURE CONTROL
is easy..

It can best be handled by the simplest and most economical type of Recorder-Controller—the "open and shut" type developed by Foxboro 24 years ago.

The "open and shut" Controller has fewer parts and requires a minimum of attention. There are no adjustments—you simply set it to the desired temperature; the instrument does the rest. And, investment is lower.

Investigate the possibilities of doing many jobs better and cheaper through the use of this simple instrument. A Foxboro representative will be glad to tell you which of your applications are among the 65% that can best be handled with the Foxboro "open and shut" type Recorder-Controller. The Foxboro Company, 24 Neponset Ave., Foxboro, Mass., U.S.A. Branches in 25 Principal Cities.

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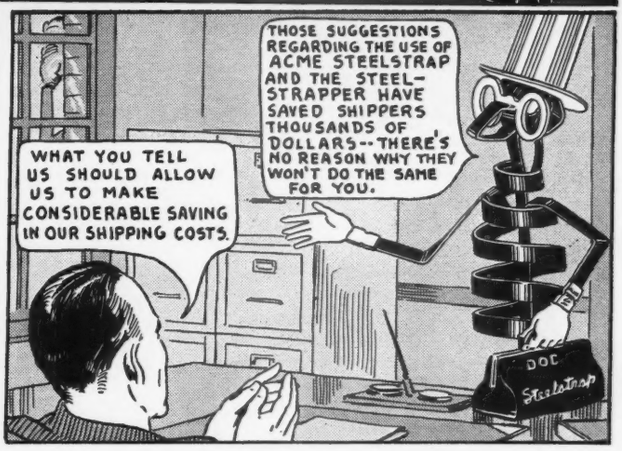
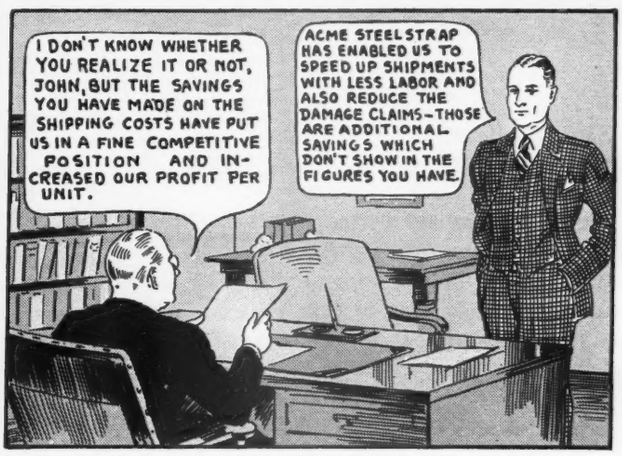
REG. U. S. PAT. OFF
TEMPERATURE CONTROLLERS
RESPONSE·ACCURACY

Doc. Steelstrap HELPS INCREASE PROFIT

YOU'VE GOT YOUR PRODUCTION COSTS IN GOOD SHAPE, JOHN, BUT WHAT ABOUT THESE SHIPPING COSTS, CAN'T WE DO SOMETHING TO LOWER THEM?
WE'RE WORKING ON THAT RIGHT NOW, W.B., AND ARE GOING TO HAVE A MEETING WITH A SHIPPING SPECIALIST THIS AFTERNOON.


WHAT YOU TELL US SHOULD ALLOW US TO MAKE CONSIDERABLE SAVING IN OUR SHIPPING COSTS.
THOSE SUGGESTIONS REGARDING THE USE OF ACME STEELSTRAP AND THE STEEL-STRAPPER HAVE SAVED SHIPPERS THOUSANDS OF DOLLARS--THERE'S NO REASON WHY THEY WON'T DO THE SAME FOR YOU.
DOC Steelstrap

THESE SHIPPING FIGURES LOOK SO GOOD, JOE, I WANTED TO BE SURE THAT YOU HAD CHECKED THEM AND INCLUDED EVERYTHING.
I WAS SURPRISED MYSELF BUT THEY'RE ABSOLUTELY RIGHT--31% REDUCTION IN WEIGHT, 40% LESS LUMBER USED AND A 27% SAVING IN COST.


I DON'T KNOW WHETHER YOU REALIZE IT OR NOT, JOHN, BUT THE SAVINGS YOU HAVE MADE ON THE SHIPPING COSTS HAVE PUT US IN A FINE COMPETITIVE POSITION AND INCREASED OUR PROFIT PER UNIT.
ACME STEELSTRAP HAS ENABLED US TO SPEED UP SHIPMENTS WITH LESS LABOR AND ALSO REDUCE THE DAMAGE CLAIMS--THOSE ARE ADDITIONAL SAVINGS WHICH DON'T SHOW IN THE FIGURES YOU HAVE.

● **"At the left is the result of another one of the thousands of problems which I have helped manufacturers solve. The shipping weight reduction amounted to 16%, 17% less lumber was used and the saving in cost was 17%.**

'My Second Strap-Book' contains many suggestions for reducing shipping costs. Send for your FREE copy today. It may be the means of making worth-while savings in YOUR shipping costs."

Doc. *Steelstrap*

ACME STEEL COMPANY

GENERAL OFFICES:

2831 Archer Avenue **Chicago, Illinois**

Branches and Sales Offices in Principal Cities

ACME STEEL COMPANY, 2831 Archer Ave., Chicago, Ill.
No obligation in either case.

☐ Send a free copy of "My Second Strap-Book."
☐ Send particulars regarding a free diagnosis of our product for better, more economical shipment.

*Name*_____

*Company*_____

*City*_____ *State*_____

YOU DON'T HAVE TO *Run a Newspaper!*

TO GET the latest news delivered to your door each morning, you don't need to operate a news plant with facilities for news-gathering, editing, printing and delivery. Daily, you obtain the news from every corner of the world, without difficulty and at low cost, because your local newspaper—a "cooperative service"—supplies it, not only to you, but also to thousands of other business men.

In a similar way a recognized industrial distributor, identified with the National Industrial Distributors' Foundation, provides a "cooperative service" in your locality that enables you to avoid work and expense in getting the bulk of your industrial supplies and equipment. He maintains complete and specialized facilities which relieve you of time-consuming, costly tasks in meeting plant requirements.

By sharing the valuable facilities of this "cooperative service" with other plants in your neighborhood, you can obtain *what you want, when you want it,* and at a cost that reflects the economies of sharing expenses. It will pay you well to call in the man who wears the N.I.D.F. emblem and plan ways to make full use of his money-saving facilities.

Welcome the Man
...who wears THIS PIN

MEMBER NIDF 1937

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•

TRADE LITERATURE

Air Conditioning Units—Catalog No. AC-201, on line of air conditioning units.—Fedders Mfg. Co., Inc., Buffalo, N. Y.

Air Coolers—Leaflet 20564-A, describing coolers for cooling air or gases for generators and condensers.—Westinghouse Electric & Mfg. Co., East Pittsburgh.

Bearings—Catalog, on line of bearings and other mechanical power transmission equipment.—Chapman Transmission Corp., 1054 Military Rd., Buffalo, N. Y.

Blower—Form 2161-A, on Type FS single-stage Motorblowers. — Ingersoll-Rand, 11 Broadway, New York.

Blowers and Compressors—Bulletin 1910, on rotary, centrifugal, and reciprocating blowers and compressors.——Allis-Chalmers Mfg. Co., Milwaukee.

Boiler Tubes—Stock List, of boiler tubes and steel.—A. B. Murray Co., Inc., 147-165 Wolcott St., Brooklyn, N. Y.

Bolts and Nuts—Bulletin No. 16, on self-locking bolts and nuts.—Dardelet Threadlock Corp., 55 Liberty St., New York.

Cast Iron Corrosion—Reprint, of article on consequences of graphitic corrosion of cast iron.—The International Nickel Co., Inc., 67 Wall St., New York.

Cast Iron Roof—Data Book, on "Usicast" cast iron roof.—United States Pipe and Foundry Co., Burlington, N. J.

Circuit Breakers—Descriptive Data 33-226, on Type F-124, 50,000 kva., indoor oil circuit breakers.—Westinghouse Electric & Mfg. Co., East Pittsburgh.

Controller—Booklet DMF 716, describing controlling device for foundry operations.—The Foxboro Co., Foxboro, Mass.

Conveyor Belt—Folder, on flat-top and open-mesh steel conveyor belt.—Acme Steel Co., 2840 Archer Ave., Chicago.

Cranes—Bulletin No. LB-2 on locomotive cranes.—American Hoist & Derrick Co., St. Paul.

Cutting Tools—Illustrated booklet, on J-Metal cutting tools.—Haynes Stellite Co., Kokomo, Ind.

Cycle Counters—Catalog Section 41-375, describing cycle counter.—Westinghouse Electric & Mfg. Co., East Pittsburgh.

Diesel Engine—Booklet, title "The Dependable Diesel," showing applications of diesel engines.—Cummins Engine Co., 220 Wilson St., Columbus, Ind.

Drafting Equipment — Folder, showing sketch pad set consisting of tracing paper with guide sheet.—Wade Instrument Co., 2246 Brooklyn Station, Cleveland.

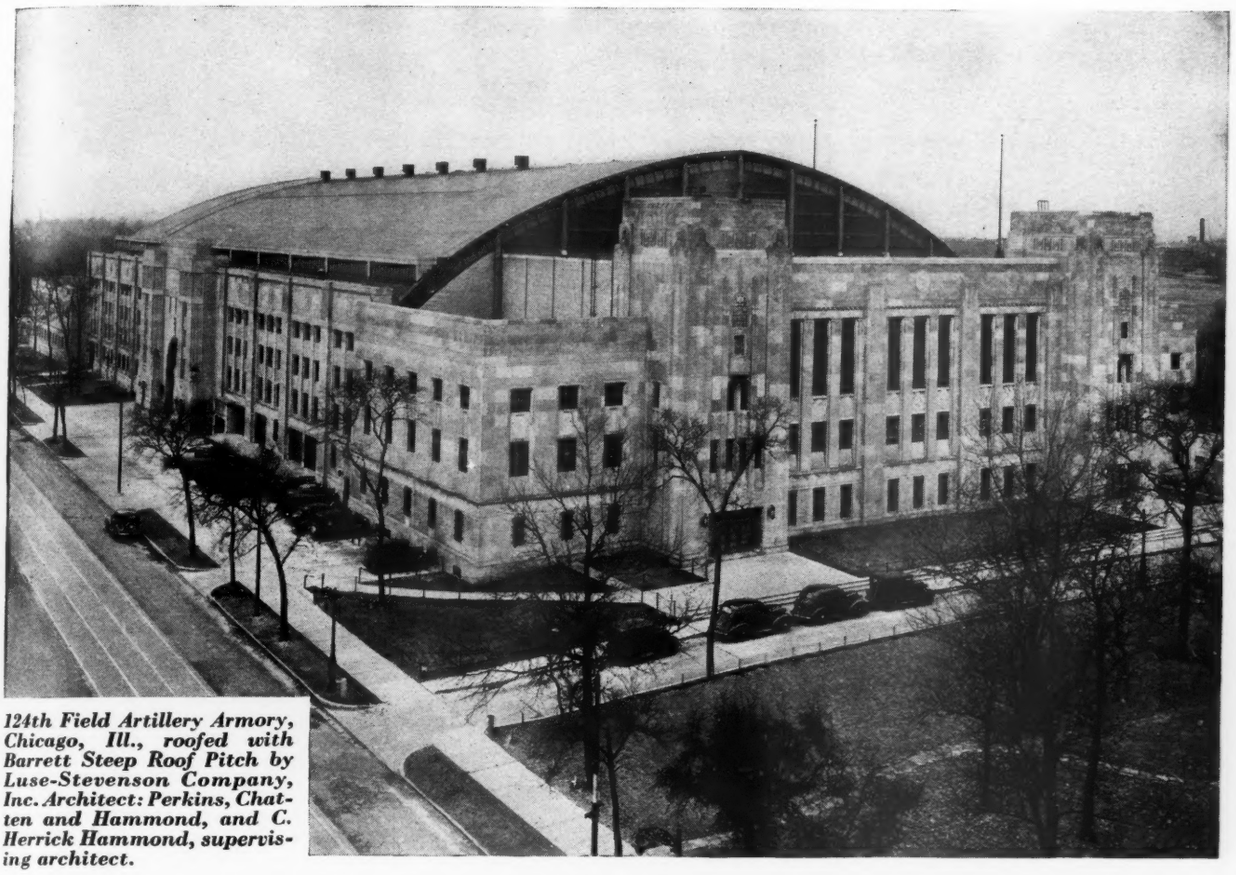
Dust Collectors—Folder, on dust collectors.—Pangborn Corp., Hagerstown, Md.

Electric Heating Devices—Bulletin GED-650, on line of electric heating units and devices for small heating jobs.—General Electric Co., Schenectady, N. Y.

Electrode Holder—Bulletin No. 321, on Type T welding electrode holder.—The Lincoln Electric Co., Cleveland.

Electrodes—Booklet No. DH-984, covering Hi-Tensile F electrodes.—Page Steel and Wire Division, American Chain & Cable Co., Inc., Bridgeport, Conn.

Fans—Bulletin No. 183, showing four new types of electric fans.—Wagner Electric Corp., 6400 Plymouth Ave., St Louis.



124th Field Artillery Armory, Chicago, Ill., roofed with Barrett Steep Roof Pitch by Luse-Stevenson Company, Inc. Architect: Perkins, Chatten and Hammond, and C. Herrick Hammond, supervising architect.

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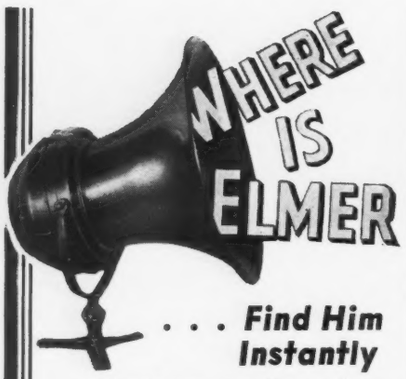

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Fittings—Folder, describing line of Style 65 compression fittings.—S. R. Dresser Mfg. Co., Bradford, Pa.

Floor Treatments—Booklet, title "Concrete Floor Treatments by Truscon."—The Truscon Laboratories, Detroit.

Glass—Folder, giving facts about transmission and diffusion of light by figured and wire glass.—Libbey-Owens-Ford Glass Co., Toledo, Ohio.

Hoists—Bulletin 126, describing the Liftabout hoist.—Shepard Niles Crane & Hoist Corp., Montour Falls, New York.

Horns—Bulletin No. 57, on horns and sirens.—Federal Electric Co., 8706 South State St., Chicago.

Instruments—Booklet, Case No. 15 of "Solving Industrial Crimes," showing graphic instruments.—The Esterline-Angus Co., Indianapolis.

Instruments—Catalog 337, on line of graphic instruments. The Esterline-Angus Co., Indianapolis.

Instruments—Stock List, "1937 Odd-Stock List" of instruments slightly marred but in good condition.—Leeds & Northrup, 4934 Stenton Ave., Philadelphia.

Insulation Testing—Bulletin No. 1490, on "Megger" instruments for insulation testing.—James G. Biddle Co., 1211-13 Arch St., Philadelphia.

Lead and Tin Products—Catalog, showing uses of lead and tin products.—Alpha Metal & Rolling Mills, Inc., 363 Hudson Ave., Brooklyn, N. Y.

Lift Trucks—Folder No. 322, describing lift truck platforms.—Lewis-Shepard Co., Watertown, Mass.

Lubrication—Bulletin D, on automatic lubricating system.—Bijur Lubricating Corp., Long Island City, N. Y.

Magnetic Brake—Bulletin No. 600, describing Style DM magnetically operated brake.—Stearns Magnetic Mfg. Co., Milwaukee.

Magnets—Bulletin on safety suspended magnets.—Stearns Magnetic Mfg. Co., Milwaukee.

Motor-Generator Sets—Bulletin 501, on motor-generator sets.—Reliance Electric & Engineering Co., Ivanhoe Rd., Cleveland.

Motors—Bulletin 1600, on polyphase wound- rotor or slip-ring induction motors.—Fairbanks, Morse & Co., 900 South Wabash Ave., Chicago.

Ohmmeter—Bulletin 1495, describing "Megger" circuit testing ohmmeter.—James G. Biddle Co., 1211-13 Arch St., Philadelphia.

Oil Burning Systems—Bulletin 119-37, on horizontal, rotary-type oil burning systems.—Simplex Oil Heating Corp., 30 Church St., New York.

Panel Instruments—Catalog Section 43-350, on miniature panel instruments.—Westinghouse Electric & Mfg. Co., East Pittsburgh.

pH Measurements—Catalog EN-96, on apparatus for hydrogen ion concentration measurements.—Leeds & Northrup Co., 4902 Stenton Ave., Philadelphia.

Plastics—Catalog, title "The Story of Plastic Molding," showing how molds are made, and describing materials.—Chicago Molded Products Corp., 2145 Walnut St., Chicago.

Potentiometer—Bulletin No. 482, on the Pyromaster recording round-chart potentiometer.—The Bristol Co., 6 Bridge St., Waterbury, Conn.

Protective Coating—Bulletin 281-B, describing Triple-A No. 20 heavy duty black coating for protecting steel.—Quigley Co., 56 West 45th St., New York.

Pumps—Booklet, on pumps for drainage, water supply, boiler feed, air conditioning, etc.—Yeomans Brothers Co., 1433 Dayton St., Chicago.

Pumps—Bulletin No. 6165, on duplex self-oiling pumps.—Fairbanks, Morse & Co., 900 South Wabash Ave., Chicago.

Pyrometers—Catalog No. 15-C, on line of millivoltmeter-type pyrometers.—The Brown Instrument Co., Wayne and Roberts Aves., Philadelphia.

Pyrometers—Catalog No. 1101C, on line of high-speed photoelectric pyrometers.—C. J. Tagliabue Mfg. Co., Park and Nostrand Aves., Brooklyn, N. Y.

Recorders and Controllers—Bulletin No. 483, on line of low range pressure and draft recorders and controllers.—The Bristol Co., Inc., 6 Bridge St., Waterbury, Conn.

Refractory Insulation—Bulletin No. 326, on Insulblox insulating refractory blocks.—Quigley Co., Inc., 56 West 45th St., New York.

Relays and Controls—Three bulletins: No. 81, on intermediate duty relays; No. 131,

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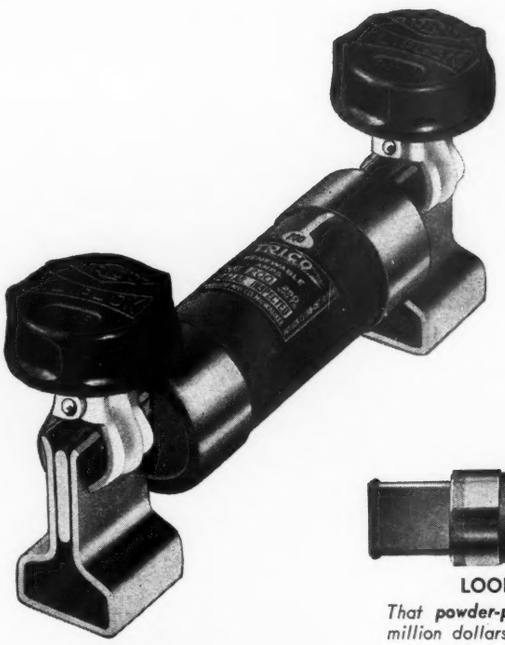

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SPUN STEEL CORPORATION
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October 23, 1936

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These fuses have as stated above given us much better service and our experience with same has been satisfactory in every way.

Very truly yours,

THE SPUN STEEL CORPORATION

W R Harrison

Supt.

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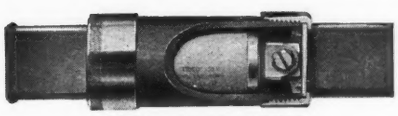

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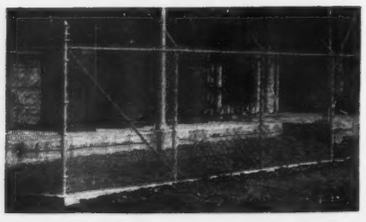

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on heavy duty relays; No. 100,000, on controls.—Ward Leonard Electric Co., Mount Vernon, N. Y.

Rheostat—Folder, on rheostat for electroplating control.—The Udylite Co., 1651 East Grand Blvd., Detroit.

Roller Chain—Dossier A-1, telling in Crime File manner a story for conveyor chain.—Baldwin-Duckworth Chain Corp., Springfield, Mass.

Rolling Doors—Catalog, on line of rolling doors.—The Kinnear Mfg. Co., Columbus, Ohio.

Rolling Doors—Folder, showing upward-acting doors and grilles.—Cornell Iron Works, Inc., 3620 13th St., Long Island City, N. Y.

Sheet Metal—Booklet, showing uses for sheet metal in wide variety of applications.—Republic Steel Corp., Cleveland.

Sprinklers—Booklet, showing savings to be had with installation of sprinkler systems.—Rockwood Sprinkler Co., 38 Harlow St., Worcester, Mass.

Stock Room Cabinets—Folder No. 2137-B, showing line of stock room cabinets.—W. C. Heller & Co., 1714 Broad St., Montpelier, Ohio.

Stokers—Bulletin, containing specifications and engineering data on small stokers.—Combustion Engineering Co., Inc., 200 Madison Ave., New York.

Tachometers—Bulletin 1485, on "Frahm" vibrating reed tachometers.—James G. Biddle Co., 1211-13 Arch St., Philadelphia.

Unit Heaters—Bulletin, covering Airheater line of centrifugal fan unit heaters.—Airtherm Mfg. Co., 1474 South Vandeventer, St. Louis.

Vibration Eliminators—Catalog, illustrating installations of vibration eliminators.—The Vibration Eliminator Co., 4126 37th St., Long Island City, N. Y.

Water Softener—Bulletin No. 600, on Two-Flo zeolite water softener.—Elgin Softener Corp., Elgin, Ill.

Welders—Descriptive Data 26-120, on Flexarc motor-driven welders and bare generators.—Westinghouse Electric & Mfg. Co., East Pittsburgh.

Welding School—Bulletin No. 416, describing Lincoln Welding School for training welders.—The Lincoln Electric Co., Cleveland.

Wire and Cable—Catalog, on line of wire and cable. Includes engineering data.—Paranite Wire and Cable Corp., Jonesboro, Ind., and Essex Wire Corp., Detroit.

Wrenches—Two catalogs: A-409, on detachable-socket and reversible ratchet wrenches; A-81, on carbon steel wrenches.—J. H. Williams & Co., 75 Spring St., New York.

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BOOKS

A. S. H. V. E. GUIDE, 1937

American Society of Heating and Ventilating Engineers, 51 Madison Ave., New York. 1,124 pages, index. $5.

Fifteenth edition. Tabular data giving properties of dry and saturated air have been recalculated based on instantaneous specific heats of air. There are new chapters on humidification, dehumidification, and water cooling equipment; automatic control; sound control; air distribution. Many additions and improvements have been made to other chapters, and a new psychrometric chart attached to the inside back over. There are 808 pages in the technical data section and 316 pages of catalog data.

VOCATIONAL GUIDANCE THROUGHOUT THE WORLD

Franklin J. Keller, Principal, Metropolitan Vocational High School, New York, and Morris S. Viteles, Associate Professor of Psychology, University of Pennsylvania. W. W. Norton & Co., Inc., 70 Fifth Ave, New York. 575 pages, index, illustrated. $4.

What is being done throughout the world to help people find their places on the complex industrial scene of today is told country by country in this descriptive work. It shows how vocational guidance and applied psychology are being used and what accomplishments are being attained, describing this against a background of economic, political, and social settings of the countries involved.

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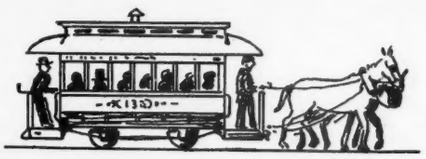

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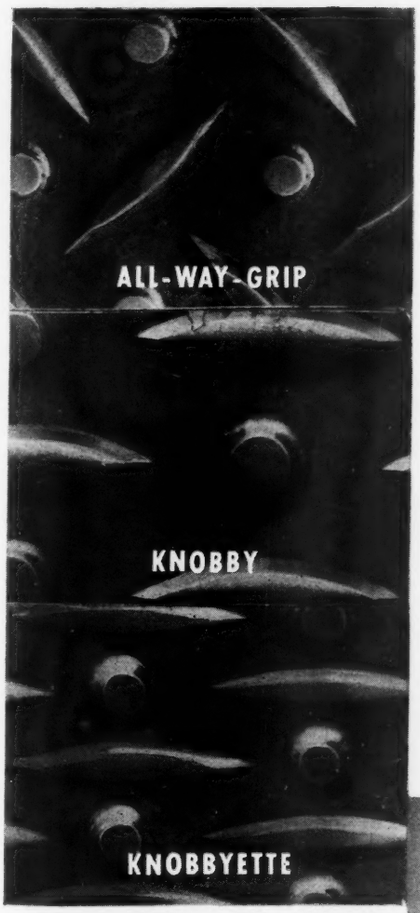

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PERSONNEL PRACTICES GOVERNING FACTORY AND OFFICE ADMINISTRATION

F. Beatrice Brower, Conference Board Research Staff. National Industrial Conference Board, Inc., 247 Park Ave., New York. 133 pages, index. $3.

This volume is a census of prevailing practices on a vast number of personnel matters, covering among other things layoffs, holidays, overtime, 5- and 5½-day weeks, sick pay. There are 73 tables based on data furnished by 865 companies with more than 1,500,000 employees. Part I covers practices affecting wage earners, Part II treats office employees.

INDUSTRIAL ELECTRICITY AND WIRING

James A. Moyer, Director of University Extension, Massachusetts Department of Education, and John F. Wostrel, Instructor in Electrical Engineering, Division of University Extension, Massachusetts Department of Education. McGraw-Hill Book Co., Inc., 330 West 42nd St., New York. 502 pages, index, illustrated. $2.75.

This is a practical book. After sketching underlying principles of electrical theory, it goes on to describe action and application of generators, motors, transformers, and other electrical apparatus. Several chapters are devoted to applications in lighting and power, including planning of circuits and estimating of costs. Second edition.

•

ON THE CALENDAR

MAY

3–7, American Foundrymen's Association, Annual Convention and Show, Milwaukee. W. F. Bornfleth, General Chairman, Care of Cutler-Hammer, Inc., Milwaukee.

10–14, National Fire Protection Association, Annual Meeting, Chicago. Franklin H. Wentworth, Managing Director, 60 Batterymarch St., Boston.

17–19, National Electrical Manufacturers Association, Annual Meeting, Hot Springs, Va. W. J. Donald, Managing Director, 155 East 44th St., New York.

17–21, American Society of Mechanical Engineers, Semi-Annual Meeting, Detroit. Clarence E. Davies, Secretary, 29 West 39th St., New York.

24–25, American Management Association, Eighth Annual Insurance Conference, Atlantic City, N. J. Alvin E. Dodd, President, 330 West 42d St., New York.

31–June 5, Smoke Prevention Association, Annual Meeting and Fuel-Burning Air-Polution Exhibition, New York. Frank A Chambers, Secretary-Treasurer, 139 North Clark St., Chicago.

JUNE

7–9, National Office Management Association, Annual Conference and Business Equipment Display, Chicago. Dr. R. P. Brecht, Secretary. Wharton School, University of Pennsylvania, Philadelphia.

18–26, Seventh Annual Economics Conference for Engineers, Stevens Engineering Camp, Johnsonburg, N. J. Harvey N. Davies, President, Stephens Institute of Technology, Hoboken, N. J.

21–24, National Association of Cost Accountants Annual Meeting, Hot Springs, Va. S. C. McLeod, Secretary, 385 Madison Ave., New York.

21–25, American Institute of Electrical Engineers, Summer Convention, Milwaukee. H. H. Henline, Secretary, 33 West 39th St., New York.

21–25, National Association of Credit Men, Seventh Credit Congress of Industry, Chicago. H. E. Kay, National Chairman, Industrial Brownhoist Corp., Bay City, Mich.

23–26, American Society of Heating and Ventilating Engineers, Semi-Annual Meeting, Swampscott, Mass. A. V. Hutchinson, Secretary, 51 Madison Ave., New York.

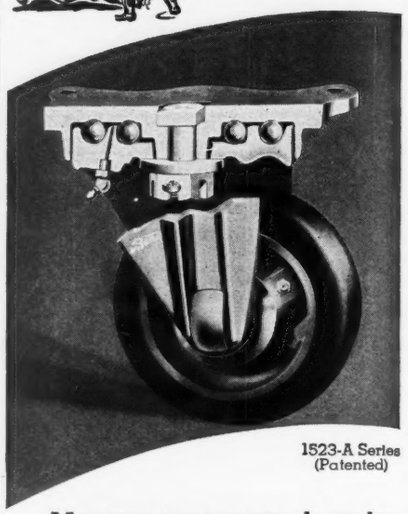
28–July 2, American Society for Testing Materials, Annual Meeting, New York. C. L. Warwick, Secretary, 200 South Broad St., Philadelphia.

AUGUST

25–28, Silver Bay Conference on Industrial Relations, Silver Bay, N. Y. Charles A. Herschleb, 347 Madison Ave., New York.

For Smoother Teamwork Use the RIGHT Caster

A catcher's mitt would make a shortstop's fielding clumsy — just as the wrong casters may cause awkward trucking.



1523-A Series (Patented)

MATERIALS HANDLING is an important part of the teamwork in any plant. Bond Truck Casters help to smooth out the kinks because each type is designed for a specific trucking job. Executives who keep a keen eye on the balance sheet know the importance of the smooth, uninterrupted service provided by Bond. For moving paper boxes or steel castings—for quick swiveling—for quiet operation—there's a Bond Caster specially designed for every need. Ask your Bond distributor—or write us for catalog K-25.

BOND FOUNDRY & MACHINE COMPANY
MANHEIM, Lancaster County, PENNSYLVANIA
617 Arch St., Phila.; 30 Church St., N. Y. C.
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Bond Power Transmitting Machinery delivers more power at less cost.